ORGANIZATION OF FOREST SERVICES

Their sociology and structure with respect to change

by

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SUMMARY

Social change and technical advance require adaptive modification to organizational structure. Failure of an organization to make adequate adjustment leads to dissatisfaction both within and without.

Forestry organizations show conservatism which is a reflection of the long term nature of many forestry projects. These organizations often share objectives, constraints and professional ethics which transcend geographical, political and frequently private enterprise boundaries. Major forestry organizations are commonly government sponsored bodies known as "forest services".

In this essay the relationship of sociological thought to organizations is examined with the objective of applying this to the problems of forestry organizations under conditions of change. Forest services might advantageously apply modern sociological ideas in planning organizational development.

Examination reveals the widespread concern with organizational adaptation in response to changing social and technical environments. Theories once appropriate to the explanation of efficient structures in organization are now commonly in disrepute. However some sociologists have reconciled seemingly disparate theories by showing that different organizational structures are appropriate in different organizational environments. The major environmental variable is its stability. The more highly structured organizations are most effective under stable conditions.

The organizational form known as "bureaucracy" has become synonymous with large organizations, particularly in government. It is a highly structured type of organization and under modern conditions of rapid change has been shown to exhibit many dysfunctions.

A modern form known as "project" or "matrix" organization is adapted to conditions of instability. Such an organizational form provides flexibility by allowing members from various branches to combine and recombine to handle tasks of finite duration.

Examples of forest service organization have been drawn from the Australian region. They illustrate a pattern which is typically a bureaucratic hierarchy. There is variation in structure primarily in the degree of decentralization. A trend towards proliferation of specialist functions at the headquarters level is apparent. Variation in structure appears to be related to the intensity of management required rather than geographical diversity.

Research workers are tied to various functional divisions and form relatively isolated groups within a forest service. The tendency for frequent and enthusiastic communication between the members of functional research groups common to different organizations provides the potential medium for inter-service cooperation.

A tendency is noted for reorganizations to occur placing functional divisions together under the name of "operations". This trend may be of short duration due to its isolating effect on planning and executive branches. With increased levels of training at recruitment and personal values placing more stress on both independence of thought and participation in practice, any organizational device limiting communication will tend to be resisted. Increasing demands for independence and individual participation in decision making point to more decentralized forest services in the future.

The contribution of social science to organizational development will be through its influence on managerial attitudes rather than through the provision of ready-made solutions.

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INTRODUCTION

There has always been an interest in organization. Concurrently, there have always been forces tending to change organizations and forces tending to preserve them. The forces for change appear to be dominant at the present time.

In Forestry there has been an increasing awareness of organization. At the same time there has been an increasing level of criticism from within. This may have been caused by a desire to facilitate more effective use of technological developments. In addition there has probably been a response to changing external environments. The latter effect has become more marked in recent times, and the threat of external challenge has always stimulated the desire for more effective organization amongst men.

This essay is largely the result of an awakening to the writings of social scientists on the subject of organizations, and a realization of their possible application to the forestry management situation.

One could suggest that forest service organizations have suffered in their organizational development through lack of exposure to this work. To a very large extent, forestry organizations have been dominated by professionally trained foresters, and the training of these officers has, until recent years, lacked any formal contact with the study of sociology. This problem, as it applies to the United States of America, has been described by Yoho (1969). There have been comparable effects in Australia.

Many attempts at improving forestry organizations in this country appear to have been based upon traditional concepts of organization, particularly within the Public Services, which "shelter" the major forest services. An approach to the problem of reorganization

which is not based upon, or tied to the traditions of bureaucracy may have much to offer. This is particularly so in the case of the many new, technically based facets of forestry, which find a place in the work of a forest service.

It is therefore the objective of this essay to examine the basis of the social science of organizations and to seek an appropriate theoretical background as the foundation for an examination of present day forest service organizations.

To those associated with forest research, within a forest service, the problem of organization seems of universal concern. The importance of research to the forestry profession, as it endeavours to relate to the needs of a changing social environment and increasing concern for natural resources, is widely recognized. It is noteworthy that considerations for improved organization have received more attention, at least in publication, by the research oriented members of forestry organizations.

In the title of this essay emphasis has been placed on the "structure" of organizations. It is not practicable or desirable to consider organizational structure separately from general organizational theory. The structure is the visible expression of the many facets which must be considered in the analysis of an organization however, and it was felt desirable to relate discussion to this most concrete of organizational terms.

The structure of an organization is that part which is most amenable to alteration, and which may also be the outward expression of important factors such as objectives, philosophies, and the values of its members, or of the society which it serves.

It is possible that the "official" structure of an organization does not reflect the current objectives of its members, and

that they are in fact achieving their goal by informal means. In such a case there are limitations to effective communication imposed by the organizational design of an earlier date. Closer examination may reveal this to be a common situation. It is surely desirable however, that the objectives of the organization and the efficiency and satisfaction of its members should be promoted by the structure of their organization and not impeded by it.

PART 1

THE SOCIOLOGY OF ORGANIZATIONS

CHAPTER ONE

ORGANIZATIONS IN A CHANGING SOCIETY

"Change is the metaphysic of our age". (Kostelanetz: quoted by Thomas and Bennis 1972, p.7.)

As Bennis (1970) has suggested, it would be most improbable if basic human relations, and hence organizations, faced with the tremendous increases in our speed of communication, data-handling and travel over the past century, were to remain unaffected. Speaking of change Thomas and Bennis (1972) have said "its acceleration and growing complexity weigh heavily on the structure, interpersonal dynamics and effectiveness of ... organization".

It is certainly a widely expressed opinion that technology induced change is affecting the nature of social behaviour and hence the effectiveness of traditional organizations. The situation can be confusing however, because it is often found that major organizations are not in themselves amenable to change. In such situations suggested changes to improve efficiency, satisfaction or the general effectiveness of human resources are difficult to justify and implement.

The problems surrounding this topic have received a great deal of attention in the fields of social science concerned with organizational theory, as well as in those concerned with its practice.

In the following pages a selection from the literature is presented, including some ideas which may be useful as guidelines to practice in implementing organizational change.

INHERENT RESISTANCE TO CHANGE

To overcome the inherent resistance to change associated with human institutions, "strategies of planned organizational change need to be developed within a frame-work that includes an awareness of the major 'exogenous' forces of social-cultural-political change confronting the organization". (Thomas and Bennis 1972).

The choice of such strategies depends largely on the perspective with which people see their organization and its role in society generally. The development and communication of such strategies has been facilitated by the concept of a "paradigm". In this context Thomas and Bennis (1972) have defined a paradigm as "that dimension of management ideology which informs the posture an organization assumes with respect to change and conflict. A paradigm emerges from the constellation of beliefs and the assumptions which individuals in the organization, particularly key decision-makers, share about the nature of their organization". They give as an example of a paradigm of planned organizational change in recent years that which has become known as the 'human relations' model.

A related idea had been previously suggested by Simon (1967) to the effect that developments in administrative theory are often the consequence of change in the social, political and cultural environment of the organization. He asked, "How far is the effectiveness of modern human relations due to a waning of the acceptance of authoritarian personality structures in the general populace?"

One might readily agree that this factor is important in the general movement towards organizational change. It would certainly be associated with feelings of concern for the effectiveness

of large institutions where resistance to change is currently noted. But it cannot explain resistance to change. Such resistance may in fact be something of an illusion due to the fact that established means of accommodating essential change in organizations results in a time lag relative to the rate of change of other facets of modern society e.g. sense of values. It often seems that the rate of change in society generally is accelerating relative to the rate of change in organizations. Organizations in competitive fields are obviously going to suffer more from loss of effectiveness in their human resources than are those in non-competitive fields.

Considering those organizations where resistance to change is evident it is of interest to note the following ideas from the literature. To a large extent recent expressions of dissatisfaction with organizational efficiency or effectiveness may have been met by the strategy of "absorption of protest" (Leeds 1968). In this the protest group attains respectable recognition in exchange for its acceptance of the legitimacy of the larger system (Thomas and Bennis, 1972).

The effectiveness of this strategy - to Thomas and Bennis the 'absorption of protest' paradigm - depends on:

1. A reliance of the top to recognize the potential for the protesting 'enclave' to contribute to organizational goals. To be effective, this paradigm requires a lessoning of 'trained incapacity', a widening of 'perspectivistic orientation' as one goes up the hierarchy of the organization. Or in Leed's words: 'With its broader, more substantive, perspective the top is more amenable to innovation than the middle hierarchy, especially when faced with internal weakness or external challenge.'

2. Accessibility of the protest group to the top: a communication channel has to be established as a vehicle for the protest enclave to gain visibility for its program. Here we have a specific instance of how a more restrictive paradigm of conflict management could suppress the useful potential in a

dissenting group. If the manager conceives of such a development only as an instance of inter-personal tension, or intergroup conflict, he may adopt a strategy of conflict resolution which could be detrimental to organizational innovation.

3. A model of the situation which can help determine the implications of the protest for the organization's central policies. This includes two images: the impact against what it will allow; and similarly, the impact the protest group feels it should have as against what it is willing to accept. Within the framework of these four parameters, negotiation occurs between the protest group and the organization aimed at defining the ultimate consequences of the issue of dissent.

(Thomas and Bennis 1972, p.17.)

STABILITY OF BUREAUCRACY

In a bureaucracy the organizational chart stresses the importance of who reports to whom and the relative level in the organization of each superior-subordinate relationship. These relationships are the building blocks of bureaucracy, which has, through long familiarity, become closely related to our interpretation of organizational efficiency. Our confidence in such an interpretation may be due to the success of bureaucratic organizations in meeting the major criteria for economic success in our society, going back over many years. These relationships when charted, provide an organizational map, at least to hierarchy, but another map is needed to chart the actual relationships needed to carry out the work of the organization. Kingdom (1973, p.4.) suggests that -

> the specter of losing hierarchical control has inhibited the publishing of alternative organization maps. Therefore, since organizational change is possible in a bureaucracy only through a vertical redistribution of power (delegation of authority) we find ourselves with remarkably stable hierarchical organizations.
>
> Unfortunately, our remarkably stable hierarchical organizations are increasingly called upon to deal with the turbulent dynamics of changing environments. At least one observer of the organizational scene has referred to the result as 'organizational dry rot'. Even more

> unfortunate, and frustrating, is the recognition of the human element at the centre of this organizational problem: stubborn human stability in the face of needed change. But it is the price we pay for allowing only one map of organization - the hierarchic map.

MOTIVES FOR CHANGE

A superficial examination of the motives underlying the widespread indications of desire for organizational change may readily place emphasis on such factors as the increase in the need for functional specialization resulting from growth in technical knowledge. While this is certainly a real influence it is one which should be readily dealt with in the normal (conventional) capacity of an organization to adapt to change. A more basic and more intimately permeating influence is the change in values of society. This is certainly a much more difficult factor to handle, especially in large organizations. It has its primary influence through society itself. Organizations, the institutions of society, must either make appropriate changes in policy or fall apart to become re-established in an approved mode. To quote Katz and Georgopoulos (1971), "organization forms today are under challenge and without creative modification may face difficulties in survival. On the one hand they are growing in size and complexity, with criss-crossing relationships with other systems and with increasing problems of co-ordination. The traditional answer in organization structure is on the technical side, more computerized programs to feedback and co-ordination, more specialization of function, more centralization of control. On the other hand, the social and psychological changes in the culture are increasingly at odds with the technological solution of more and more of the same".

Thomas and Bennis in their review (1972) have indicated a number of social changes observed by prominent social scientists in recent years. Kahn (1969) has drawn attention to "further decline

in the sacred in favor of the secular, more pragmatism, the rise of future oriented thinking and the improvement of tools for this purpose, the increasing application of rationality to social, political and cultural problems, the decreasing importance of primary occupations, and so on. In general, an acceleration of those trends which have become associated with 'post-industrialism'." Reich (1970) has similarly identified a development in social values. "Consciousness III - a system of values and a life style which is normative, ideological, utopian, visceral, humanistic, communal, sometimes hedonistic and transcendental", opposed to what is viewed as a dominant social drift towards the"technocratic rationality of post-industrialism."

Wilson (1970) has foreseen changes in value systems which will be the major determinants of social, political and economic developments. They include

(a) Organization ⟶ individual. Organizations will be accepted or rejected according to the emphasis they place on the rights of the individual.

(b) Uniformity (conformity) ⟶ pluralism.

(c) Independence ⟶ interdependence. There will be an awareness of the need for co-operation and inter-disciplinary approaches.

(d) Future ⟶ immediacy. One of the major tensions of the future may result from a growing demand for instant solutions, for immediate gratification.

(e) Moral absolutes ⟶ situation ethics.

Many features of such indications of changing personal values are familiar to us, and frequently arise in the context of expressions of desire for an "improved organization".

According to Harman (1969) "the trend is towards institutionalization of the process of research-development-innovation-disemination, and towards the development of organizational forms adapted to promoting change".

Drucker, (1969) has described the emergence of a 'knowledge society' in which knowledge is the central capital. Demand grows for skilled, semi-professional and professional labourers and diminishes for unskilled, unknowledgeable labour. There is an expanding fraction of the populace involved in education and an expanding fraction of the national income going to education.

Harman (1969) also suggests that recent trends of increasing affluence, increasing levels of education, and changing child-rearing patterns have combined to produce an increasing proportion of the populace who are 'growth-motivated' rather than 'deficiency-motivated'. The result shows itself in signs of changing values in the direction of higher valuation of the feelings and subjective side of life, of self-realization and of meaning and significance in work. He notes that there is more questioning of traditional work values, and a tendency to blur the distinction between work, leisure and education.

The rise of "future-oriented thinking" indicated above, may be regarded as yet another expression of concern with present-day organizational form.

CHANGING PERSPECTIVES

W.G. Bennis (1970b) in re-examining his prognostications with regard to the conduct of organization and managerial practices made some years earlier (Bennis, 1964) found that new experiences and other emergent factors had combined to provide a new perspective which cast doubt on a number of his earlier assumptions. The conclusion of his early analysis had been that bureaucracy "an elegant

social invention" would be "hopelessly out of joint with contemporary realities", and that "we would witness and participate in the end of bureaucracy as we (then knew) it and the rise of a new social system better suited to twentieth-century demands of industrialization."

The basis of this argument makes an interesting summary of factors which must still be apparent as influencing the desire (and need) for organizational change:

1. The exponential growth of science, the growth of intellectual technology, and the growth of research and development activities.
2. The growing confluence between men of knowledge and the men of power.
3. A fundamental change in the basic philosophy which underlies managerial behaviour, reflected most of all in the following three areas:
   (a) a new concept of man, based on increased knowledge of his complex and shifting needs, which replaces the over-simplified, innocent push-button concept of man;
   (b) a new concept of power, based on collaboration and reason, which replaces a model of power based on coercion and fear; and
   (c) a new concept of organizational values, based on humanistic-democratic ideals, which replaces the depersonalised mechanistic value system of bureaucracy.
4. A turbulent environment which would hold relative uncertainty due to the increase of research and development activities. The environment would become increasingly differentiated, interdependent, and more salient to the organization. There would be greater interpenetration of the legal policy and economic features of an oligopolistic and government-business-controlled economy. Three main features of the environment would be interdependence rather than competition, turbulence rather than a steady, predictable state, and large rather than small enterprises.
5. A population characterised by a younger, more mobile, and better educated workforce.

Bennis believed that these conditions would bring about some significant changes. "The increased level of education and rate of mobility would bring about certain changes in values held toward work. People would tend to (a) be more rational, be intellectually

committed, and rely more heavily on forms of social influence which correspond to their value system; (b) be more 'other-directed' and rely on their temporary neighbors and workmates for companionships, in other words, have relationships, not relations; and (c) require more involvement, participation and autonomy in their work."

These factors appear largely relevant to the Australian situation at the present time, particularly to the typical forest service, although Bennis states in his 1970 paper that the organizations he had in mind (in his 1964 paper) were "instrumental, large-scale science based, international bureaucracies, operating under rigid growth conditions: and that "service industries and public bureaucracies" were excluded from the analysis.

It is interesting to note the reconsideration made by Bennis (1970b). As a result of the many upheavals in his (a United States University) environment over the intervening years he finds a situation plagued by dilemmas in the social scene. The demand for change in institutions has become both loud and complex.

> ... the threat to legitimacy of authority, the tensions between populist and elitist functions and interdependence and complicity in the environment, the need for fresh metaphors, the discontinuities between micro system and macro systems, and the baffling competition between forces that support and those that suppress the adoption of democratic ideology. All together, they curb my optimism and blur the vision, but most certainly force a new perspective upon us.

On the other hand, other social scientists concerned with the topic of organizational change, e.g. Brucker (1964) and Gardner (1963), have asserted that the kind and nature of present-day change, referring to organizational environment, precludes prediction of the future. (Terreberry, 1968).

A great many contributions have been made towards this topic of socio-economic and technical change and its effect on organizations. Those mentioned in this Chapter cover a range of responses to the problem. The extent of the problem is such as to have resulted in the development of a specialized field of study, and it has even become a popular field of writing, as evidenced by Alvin Toffler's "Future Shock". But before we look at something like that author's 'Adhocracy' (Toffler, 1970) as a possible solution to organizational problems in Forestry we should look at the development of organizational theory and some of its modern forms.

CHAPTER TWO

A GENERAL REVIEW OF THE THEORY OF ORGANIZATIONS

> By implication or explicit recommendation the current literature suggests to the manager the utility of divergent managerial styles, organization structures and climates, and types of managerial training. For the behavioral and social scientists who devote their lives to understanding these topics, the apparent contradictions and ambiguities are confusing enough, but for the practicing administrator who is supposed to use this new knowledge as a guide in making organizational decisions, the confusion may at times seem insurmountable.
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> (Lawrence and Lorsch, 1967).

The nature of this topic, especially in a modern era of change, makes a warning worth heeding. Tom Burns has said, "the beginning of administrative wisdom is the awareness that there is no one optimum type of management system." And Joan Woodward has suggested, "The danger lies in the tendency to teach the principles of administration as though they were scientific laws, when they are really little more than administrative expedients found to work well in certain circumstances but never tested in any systematic way."

In treating this material, the output of current sociological research into organizations, with a view to adapting its principles or tenets into management practice, it is increasingly important to be aware of the fluidity of thought in these issues. To quote Tom Lupton (1971):

> As more managers become interested in the social sciences and their organizational implications they will be drawn into arguments about the theories that underlie the various prescriptions for action. It will be a pity if managers become trapped in traditional postures at a time when traditional theoretical positions are being rapidly eroded by new research and theory-building about the nature of open socio-technical systems.

"Social science" he says "must be seen by managers as a method of analysis and as suggesting courses of action and decision."

AN HISTORICAL OVERVIEW

An understanding of modern theories of organization can be facilitated by an awareness of their historical development. There was little development prior to the advent of the industrial revolution in the mid-eighteenth century. However, keeping track of trains of thought and lines of influence has become a difficult task in recent years.

Despite the dearth of records in early literature, interest in the theory of organizations is known to cover a wide time span. We find it treated as far back as the Greek philosophers, but the English economist Adam Smith, in his *The Wealth of Nations* (1776) is often regarded as the first in the history of social science to attempt to formalize a theory or organizations. This he did by conceptualizing and organizing the thinking of others who had influenced him. (Hodge and Johnson (1970), p. 17). We then have few significant contributions until about the end of the nineteenth century. Since then there has been increasing interest shown by social scientists in organizational problems. Lupton (1971) has considered this to have been due to the emergence of large-scale and increasingly complex industrial organizations over the past seven or eight decades, with a corresponding increase in problems to be studied. He distinguishes between the various branches of social science which have become thus involved. At first were those psychologists concerned mainly with the effect of physical environment.[1] Social anthropologists

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1 The problems of industrial organizations in the First World War stimulated the application of psychological knowledge to industry (in Britain) and gave birth to Industrial Psychology. This work was carried out under the auspices of the Health of Munition Workers' Committee and its successor the Industrial Fatigue Research Board. Lupton (1971), p.28.

were early involved in the United States of America. Then came social psychology and sociology. Economists and political scientists he sees as only recently taking an interest in internal organizational decision-making. "As a result of all this work the possibility now exists of a social science of organization which will draw upon the methods and findings of all social sciences." As to the field of study, it is in effect "quite narrow and easy to comprehend" - relating "to the difficulties for human individuals and groups which arise from working in organizations and from trying to make organizations work more effectively." The particular interests of social scientists in organizations, as Lupton (1971) sees them, are:

1. The consequences of various ways of allocating and distributing work and authority, i.e. in problems of structure.
2. The nature of conflict and co-operation in organizations and their relation to structure.
3. Human motivation, satisfaction and incentives.
4. The communication of ideas, orders and information.
5. Physical and mental health and its relation to the physical and social environment of the individual.
6. Technical and administrative change.

Lupton traces the origin of a systematic study of industrial organizations to a group of "practical managers" of whom the most prominent was F.W. Taylor. This group has become known as the "scientific managers". Facing what was then a "new problem of achieving efficiency in large, technically complex factories", Taylor considered "the main obstacle to efficiency was a failure by managers to find ways to co-ordinate and control the work of industrial operations while at the same time offering rewards for their co-operation which would satisfy them". The results of this group's work - methods such as time and motion studies, have remained with us as reminders of their brilliant success. However, although "getting the right atmosphere" was stressed by the scientific managers, they were

primarily concerned with the physical activities in organizations and lacked the theoretical basis of psychology and sociology (then undeveloped) to allow the systematic development of procedures to overcome intergroup conflict within their organizations. They did not understand the real nature and origin of such conflict.

The studies by the German academic Max Weber (who was a contemporary of the early "scientific managers"), in particular those relating to the analysis of formal organizations, stand among the best known and influential in the field of sociology. Of primary concern to us are his studies of the organizational form which he called 'bureaucracy'. The success of this organizational form has been such that it has been the most important element in the structure and working of large organizations during the twentieth century.

Taylor and the other scientific managers were interested in the physical efficiency of operations, directed to this purpose by managers, but not in the organizational form as such. Weber took the opposite approach, but of course both "schools of thought" worked completely independently of each other. Weber's work was not to become widely known until many years later.

A development of the approach taken by the scientific managers may be seen in the work of the British industrial psychologists. They placed much more emphasis on the problems of the individual in carrying out his organizational role, than Weber, but although closer to Taylor in this regard they were mainly concerned with improving productive performance by improving physical working conditions, and "had a much more refined conception of the complexities of the individual human organism" (Lupton 1971).

An important advance in social science applied to organizations developed in the United States of America with its home the

Graduate School of Business at Harvard University. Lupton has seen this as a development in the tradition of the British industrial pychologists. Elton Mayo brought this school to prominence through the research work commenced at the Hawthorne works of the Western Electric Company near Chicago in 1924. These studies, which have become famous as "the Hawthorne experiments", were initially concerned with the factors in the physical and social environment which affect both the working performance of an individual in an organization and his personal satisfaction with his work. The real significance of these studies lies in their determination that the effect of group relationships is a major force interfering with the effect of physical factors on the performance of an individual.

Although the results of their work was popularised to such an extent as to become widely known, the theoretical nature of their work is seen by Lupton (1971) to have had less acceptance amongst managers than that of a group of writers he has described as the "theorists of formal organizations". Amongst these he places Mooney and Reiley in the United States, Urwick in Britain, Fayol in France and more recently, Koontz in United States. Of the first three of these he says, "Although they have much in common with Weber, these writers seem to have been entirely unaware of his work. Like Taylor they were practical men interested in the problems of their time, problems of large scale organization with complicated technologies". It is undoubtedly this bent towards the solving of practical problems in organizations which lead to their widespread acceptance. The exposition of apparently abstract expressions of the elements of formal organization together with guides, based on practical experience, for the design and management of organizations, has a ready appeal and is a style adopted in many management directed texts and business magazine articles.

Of considerable importance in understanding the nature of this school of thought is the concept of analogy. Unwick claims to use an "enginnering analogy" in his analysis of organizations because "men are not sophisticated enough yet to understand and work with an organic one", (Lupton 1971).[1] This is a common feature in all the earlier writings on organization. "Not until recent years have sociologists and social psychologists shown the value of working consciously with an organic analogy" (Lupton 1971).

In summarizing his impression of these workers Lupton (1971) says "The formal organization theorists, and Weber, have also been criticized for only having raised problems of organization without having proposed solutions to them". However he sees their work of great value in having done just this.

Since the time of the Hawthorne experiments theoretical developments in the field of psychology have made it possible to look more closely at the effects of organizational procedures and controls on human organisms, thereby making it possible "to suggest patterns of organization and management which will release individual potential" (Lupton 1971). In this review Lupton has indicated Likert (1967) Argyris (1957) and McGregor (1960) as being the foremost among contributors to the development of theories about the relation between the organization and the individual. "Their ideas are based on carefully planned and executed research into the structure and functioning of organizations and the behavior of individuals and groups within them".

Although the industrial psychologists were early concerned with the effects of physical conditions of work on efficiency and

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1 This perhaps may be taken to infer that he would have preferred to use an 'organic' analogy, adopted by more modern writers.

human welfare, it was not until much later that sociologists took up the idea that varying technology could lead to modifications being necessary or desirable in organization.

> The principles of organization and management proposed by the theorists of formal organization claimed universal applicability, regardless of the particular organizational setting in which they were applied. Weber's ideal type bureaucracy was also a kind of prototype for an efficient, modern large-scale organization - governmental, industrial or commercial.
>
> (Lupton 1971).

This aspect of study has been most actively undertaken in Britain by Burns and Stalker (1961), Woodward (1965) and Scott *et al* (1956) and in the United States by Walker and Guest (1956).

A further line of study which was given impetus by the Hawthorne studies (Lupton 1971) has been the effect of social groups in industry. The theoretical grounds for the advance in this line of work was laid by Lewin (1951) and Homans (1951). Contributors to this field have included the University of Michigan team in the United States, with whom Likert has been associated, and the Tavistock Institute of Human Relations in Britain. Lupton lists among significant individual contributors Roy (1954), Lupton (1963), Cunnison (1965), Wilson (1962) and Sayles (1958), while Zaleznik, Christensen and Roethisberger (1958) of Harvard University have extended knowledge of the structure and functioning of working groups to attempt prediction.

The trend in the social science of organizations can thus be seen to have changed from the "armchair theorizing" of Weber and generalizations based on attempts at solving practical problems (the scientific managers and formal organization theorists) to "a concern with the scientific investigation of human behaviour in organizations". (Lupton 1971). With a few exceptions this trend has carried the study from the scene of practical application in industry to that of the research environment of universities and other institutions. The

result has had its disadvantages from the point of view of industry in that the interchange of results and the chance of withdrawing any practical relevance has become rather too remote. As Lupton (1971) has said,

> All this theoretical interchange can be very confusing to the manager who encounters it and who is asking what appear to be simple questions about how to handle change smoothly, what kind of incentives are best, how to deal with the conflicts that crop up in the organization, why strikes happen and how they can be prevented, whether to organize by product or by process, how to deal with the specialist in the organization, and so on.

The task of abstracting usable results has become more difficult as a result of the increasingly accepted use by social scientists of an organic analogue in a changing environment. However the use of such a model has been shown to be a useful aid to the analysis of practical problems of decision making.

To quote Lupton once more on this topic, "the findings will obviously have some practical value, but at the moment there is still work of popular diffusion to do, and a theoretical job of integrating the results of many researchers into a comprehensive theory of organization".

SCHOOLS OF THOUGHT

While looking at the historical development of the social science of organization it is worth considering a commonly used approach, namely that of classifying contributors into schools of thought. In effect, it is doubtful whether such an approach has any real value other than as a very broad guide to context in the development of theory. Especially in recent years, the field of study is far too prone to overlapping of related issues to allow any real polarization of viewpoints on other than issues of limited scope.

The most common schools of thought referred to in the literature are the Classical School and the Human Relations School,

but there are variations. Hodge and Johnson (1970) have developed the idea of schools of thought along historical lines. While recognizing that their "schools of thought" overlap in various ways, they have distinguished three schools up to the present day.[1] In doing so they recognise that some workers during their own period of contribution have actually progressed from one school of thought to another, and also that some workers have continued refinement and enlargement of their school of thought beyond the date chosen (by Hodge and Johnson) as the terminating boundary or horizon in time.

Contributions prior to 1930, largely undocumented,[2] are classed as the School of Classical Doctrine. This school is characterized by its having dealt "almost exclusively with the anatomy of the formal organization." (Hodge and Johnson 1970). These authors consider that a popular impression of this school of thought, that it ignored the human element in an organization, is incorrectly founded. They say however that "the classicists over-estimated man's ability to achieve perfection in the art and science of organizing".

The period from 1930 to 1950 is classed by Hodge and Johnson as that of the Neoclassical School. They consider the classicists to have developed the study of organizations and management and made known the body of knowledge that had developed in society through trial and error or "informal" means. The Neoclassicists are

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1 It is interesting to note in this text that the authors treat the development of sociological theory relating to organizations in a manner which virtually ignores contributions from nations other than United States of America. Adam Smith is a noteworthy exception to this.

2 Mooney and Reiley (1931) are regarded by Hodge and Johnson as having presented a work of historical significance in their book "Onward Industry", "bringing together in a chronological fashion the significant concepts of pioneer thinkers in organization theory".

distinguished from the Classical School by their recognition of "the need for modification of classical doctrine to accommodate the complexities of human interactions and the social and psychological needs of human individuals in organizations". According to Hodge and Johnson, the major contribution of the neo-classical writers, is that "organization theory is made up of a highly complicated set of independent relationships". They regard the Neo-classical School as having its beginnings with the Hawthorne studies of the human element in organizational effectiveness. This school of thought is considered to be still the subject of refinements and expansion.

From 1950 to 1970 (the present) is described as the era of the Modern Doctrine School. Here the underlying characteristic is considered to be that sociological work on organization theory rests upon "a conceptual analytical base". Hodge and Johnson see a transition period from that of the Neoclassical School marked by "the application of mathematical and behavioral concepts to the development of a general theory of management". The idea of a Modern Doctrine School must loose some impact when one notes that it is regarded as being broadly composed of those writers "who do not fit into the classical or neo-classical categories". The modern school is seen to be examining aspects of the organization which were previously neglected by the classical and neoclassical schools. These include: strategic parts of the system - the nature of their mutual dependency; processes in the system linking parts and facilitating their adjustment to each other; system goals; and research tools applicable to study of the system.

It is apparent that Hodge and Johnson favour the tenets of their classical and neo-classical schools, despite criticism by modern contributors to social science which imply that the conclusions

of the earlier workers lacked supporting data from properly planned experiments. They suggest that the bases for the tenets of the older schools of theory - whether they have "stood the pragmatic test of time" or have been "supplied by expert testimony" were as acceptable for the validification of hypotheses as may be the evidence from modern experimental methods.

TRADITIONAL CONCEPTS OF ORGANIZATION

We have now looked at the historical development of sociological thought relating to organizations from two approaches. The first was the evolution of organizational theory as contribution built upon contribution from a number of disciplines within the field of social science (Lupton). The end point of this evolution would appear to lie in the development of a theory of organizations which could account for all variables and every situation. The second (Hodge and Johnson) took the line that schools of thought, developed in different periods of time, have provided the basis of organizational theory required for management practice during different periods. This approach has recognised that the different schools of thought have in fact existed concurrently although each has had its period of more general acceptance.

It is a fact recognised by others (Lawrence and Lorsch, 1967) that at the present time we have a considerable number of 'theories of organization' recognised and practiced by different parts of society. They cite as a significant fact the co-existance over the past thirty years of two dominant forms of organizational theory, that of the classical school and that of the school of human relations. The fact that two conflicting theories have existed side by side over such a lengthy period of time, and with practical success in different

circumstances, can be seen as indicative of the need for a theory of organizations which can cover all circumstances. Lawrence and Lorsch propose that this is not only possible but that such a theory "is gradually taking form in the recent literature". They suggest that the classical and human relations schools may in fact be considered as operating successfully at extremes of the wide range of conditions met within organizations.

Before dealing with modern attempts to provide a theory of organizations which adequately explains the facts observed in real life and is also amenable to use for predicting the organization forms to best suit particular conditions or tasks, we should be aware of the major tenets of the two major theories on which modern ideas have been built.

The Classical Theory

Writers associated with this theory, some of whom we have already mentioned in this chapter, have come to be known as the "classical" or "administrative process" school. Their ideas have persisted in business management, as indicated to some extent by the commonplace use of their terms - "authority", "responsibility", "line and staff", "functional vs. product organization", "chain of command", etc. In the classical theory, an organization is conceived of as being formed by division of labour and a line of command that serves to integrate the differentiated parts which are the result of such division. The resulting organization is characterized by the structural attributes of -

1. Limited and prescribed channels of communication which are facilitated by detailed role descriptions and authoritative leadership styles;
2. a typically narrow span of control.

This has been summarily described as a highly formalized structure with a directive or authoritarian leadership style.

(Lawrence and Lorsch, 1967).

The advocates of the classical school see this type of organization as one which leads to high performance. The early classicists saw it as universally applicable.

Lawrence and Lorsch have looked at the development of this form of organizational theory in the context of both the socio-economic environment of the time and the background and interests of its proponents. They have shown this class of organization to be adapted to the generally stable environment as well as the traditionally accepted master-servant relationships. They suggest that the success of this organizational form is directly related to the organizational environment - which must be a stable one.

Of central importance in the application of the classical theory are the ideas of responsibility and authority. These concepts are in effect dependent upon the idea of delegation. Authority may be delegated and this results in a responsibility being incurred by both the giver and receiver of that authority. *Authority is treated as though it were a finite substance.* There could only be a certain amount of authority within an organization, and this was in fact vested in the leader - the supreme authority - from whom it was delegated in ever decreasing amounts down the line or "chain of command". There is an inevitable association of the idea of "authority" with that of "knowledge". The power that an officer of an organization possesses through delegated authority can be described as "position-based influence". In the classical theory then, "position-based influence" is equivalent to or coincides with "knowledge-based influence". In modern theory (Lawrence and Lorsch) there is a distinct difference.

The important notion of motivation was largely neglected in the classical theory. It relied upon the rewards and punishments which could be dispensed through the chain of command to induce the necessary sense of responsibility or motivation. The effect upon motivation which personal interaction with peer groups within an organization has, was completely neglected.

Lawrence and Lorsch suggest that it was "the classicists' inadequate treatment of the entire issue of motivation" which historically "stimulated the rise of the newer theory", that of the Human Relations School.

Human Relations Theory

Although there have been considerable refinements of thought, and associated advances in sociological theory, affecting the Human Relations School, all the major lines of subsequent enquiry were foretold in the range of topics considered in the famous Hawthorne studies. Widespread interest in these studies, as we have already noted, not only led to an increase in the pace of human relations research, but it started a movement to change management practices.

Prominent amongst the findings of those studies was the demonstration that informal work groups can provide either mutual support for or effective resistance to management schemes for increasing output. The gap between management and the workers which this revelation highlighted led to attention being directed at the problems of communication up and down the hierarchy and between groups. These studies prompted attention to the upgrading of the "interpersonal competence" of managers.

Lawrence and Lorsch (1967) have summarized the effects of Human Relations Theory on Management as having created a general movement towards:

1. Securing the participation of lower echelons in solving the organization's problems, and
2. fostering more openness and trust among individuals and groups in organizations.

These authors note that the Human Relations Theory has appeared alongside Classical Theory as another universal prescription for all managers and all organizations, despite the "non-universalist stance" of its principal founders.

Two elements have been seen to have led firstly to the proliferation and then to ready acceptance of the ideas of the human relations school. The first is related to the background of the researchers themselves, whose experience was largely with the relatively unstructured organizations of universities. The second was the development of an environment of uncertainty and change, resulting largely from the growth of science based technologies.

In the Hawthorne studies it was noted that the existing classical management practice and a relatively high level of technical change led to a continual disruption of relationships between upper and lower echelons of organization. This was overcome by the introduction of participative management practice - in other words an acceptance of non-coincidence between position-based and knowledge-based influence. It meant a change in the traditional direction of communication between managers and workers. The organizational structure appropriate to a situation of stability was not appropriate under conditions of instability.

The Human Relations Theory can be said to advocate the general use of a low-structure organization, along with widely shared influence (knowledge-based rather than position-based authority) and open, confronting modes of conflict resolution. Lawrence and Lorsch consider it has placed almost all its emphasis on realizing a high state

of integration and has definitely played down the utility and importance of concurrently achieving appropriate differentiation.

A STATE OF CONFUSION

The acceptance of both forms of organizational theory today has caused difficulties for managers. Lawrence and Lorsch have shown that it is possible for organizations based on either of these theories to co-exist, but for success they must be in different but appropriate environments. Troubles can arise when a manager who has found success with the techniques of one theory, applied in an appropriate environment, tries to apply the same ideas in a different (environmentally) situation. It is simply because distinctly different environments persist that the application of both theories may happily co-exist in any one time and place. The difficulties relate to a lack of understanding of the effects of different environments upon the efficiency of organizations.

As indicated above, both theories can be seen as representing the extremes of a continuum of organizational types. They represent a situation which other workers have described as mechanistic vs. organic or organismic systems of management (Burns and Stalker, 1961), and Theory X vs. Theory Y (McGregor, 1960). To a large extent however, they are merely extensions or refinements of thought along the same lines, distinguishing the effects of different environmental conditions upon the form of organization best suited to a given situation.

The basic problem in this subject is, as expressed by Pugh (1971), "*How much* organization and control of behaviour is necessary for efficient functioning?" The two sides of a continuing debate, as indicated by the ideas of opposing theories, may be taken as implied answers to this question.

> On the one hand there are those who may be called the "organizers" who maintain that more and better control is necessary for efficiency. They point to the advantage of specialization and clear job definitions, standard routines and clear lines of authority. On the other hand there are those who, in this context, may be called the "behaviourists" who maintain that the continuing attempt to increase control over behaviour is self-defeating; that the inevitable rigidity in functioning, apathy in performance, and counter-control through informal relationships, means that increased efficiency does not necessarily occur with increased control. Even when it does it is only in the short term and at the cost of internal conflict and greatly reducing the organization/s ability to cope with the inevitable environmental changes which take place in the long term.
>
> (Pugh 1971).

There is thus a dilemma in the study of organization theory. Both sides may be right, and recent researchers have sought a way of presenting organizational theory which will account for both sides of this long standing argument. Some novel and influential attempts have been made to do this. Some of them are dealt with in Chapter 3.

CHAPTER THREE

SOME NEW APPROACHES TO ORGANIZATION THEORY

> The increasing knowledge about the functioning of organizations can provide useful tools for making sounder organizational decisions if some order can be brought to the present confused state of organizational theory.
>
> Lawrence and Lorsch (1967)

Over the past decade there have been some significant departures from what had become the traditional ways of thinking about organizations. While this has largely been confined to a theoretical basis, the workers concerned have shown an increasing interest in the practical application of their ideas. As indicated in the preceding chapter the trend has been towards the collection of data on a planned experimental, or sampling basis, with efforts made towards the quantifying of this data in a way amenable to statistical analysis. At the same time there has been an increasing emphasis on reappraisal of the concepts of organization.

It may be said that the past decade has become virtually a "renaissance" of organization related sociology. We may attribute this to the increasing and wide-spread concern for both organizational efficiency and human satisfaction. As discussed in Chapter 1, this has been commensurate with changes in attitudes and of values in society - a by-product of the increase in standard of living. In this chapter we will deal with two of the more recently developed concepts. While it is hoped that the contributions discussed are reasonably representative of modern sociological works on organization theory and practice it would be unfair to suggest that they are the most significant.

I THE CONTINGENCY THEORY APPROACH

According to Tosi, Aldage and Storey (1973) the contingency approach is currently in vogue in organization theory. This assumes that if certain environmental parameters can be specified, the best form of organization can be determined. These writers find this approach reminiscent of some of the criticism levelled at Taylor and Fayol, who had taken the approach that there must surely be one best way to organize. Among the modern theorists who may be associated with the contingency school are Thompson (1967), Burns and Stalker (1961), Woodward (1965), and Lawrence and Lorsch (1967). Their arguments, according to Tosi, *et al*, (1973), centre on the existence of an optimal fit between organization structure and some contingency factor such as technology, situational favourability, environmental uncertainty, etc.

The monograph of Lawrence and Lorsch (1967) entitled *Organization and Environment. Managing Differentiation and Integration*, consists of "a study of the relationships between the structural characteristics of complex organizations and the environmental conditions these organizations face". This is a multi-dimensional study, i.e. viewing the organization as a social system, with complex relationships between its structure, the economic and technological environment, the decision-making behaviour of managers and its performance, measured on some external basis. It is aimed at gaining an understanding of those characteristics which enable an organization to deal effectively with different kinds and rates of environmental change. The study deals with industrial firms (ten) - "in three industrial environments characterized by differences in environmental certainty and by variations in corporate performance."

Contrary to the opinion of Tosi *et al* (1973), Lawrence and Lorsch have seen themselves as seeking relationships between organizational states and processes and external environmental demands, so that, rather than focus on "the one best way to organize in all situations" they may answer the question, "what kind of organization does it take to deal with different environmental conditions?"

Their concept of an organization is as an open system in which the behaviours of its members are themselves inter-related. As a system increases in size it is differentiated into parts, whose individual functioning needs to be integrated if the whole system is to be viable. It is important that an organization be able to adapt to changes in the external world.

The complexity of the external environment and the fact that any one group of managers has a limited span of surveillance, are seen as the causes of the segmentation or differentiation process. The need for unified effort on the part of the organization as a whole results in the process of integration. Lawrence and Lorsch recognise that the process of segmentation or differentiation in an organization has an influence on the individual behaviour of organization members. They state, "By differentiation we mean these differences in attitude and behavior, not just the simple fact of segmentation and specialized knowledge." Each functional unit may develop different formal reporting relationships, different criteria for rewards, and different control procedures. They identify three specific dimensions of these differences:

1. differences between managers in different functional jobs in their *orientation towards particular goals*;
2. differences in the *time orientation* of managers in different parts of the organization;
3. *interpersonal orientation* i.e. dealing with colleagues.

They also investigate a fourth dimension of differentiation, *formality of structure*.

Integration is defined as "the quality of the state of collaboration that exists among departments that (is) required to achieve unity of effort by the demands of the environment". They also use the term to describe the process by which this state is achieved and the organizational devices used to achieve it.

They recognise that the different points of view held by various functional specialists are frequently going to lead to conflicts about what direction to take. To achieve effective integration such conflicts must be resolved. Resolution of conflict is an important factor in organizational efficiency, as well as for personal satisfaction of individual members.

> ... there seems to be an important connection for the individual between working in an organization structured to deal effectively with its task and his feelings of personal satisfaction and growth. Organizations so structured that members can deal realistically and effectively with their tasks will provide powerful sources of social and psychological satisfaction and growth.

Lawrence and Lorsch recognise the following methods of resolving conflict:

1. Through the managerial hierarchy.
2. Through integrating committees and teams or individual integrators who are designated to facilitate collaboration among functional departments at all managerial levels.
3. Routine control and scheduling procedures.
4. By individual managers outside official channels.

Also recognised as of considerable importance in organizational integration are interpersonal skills. Lawrence and Lorsch indicate that behavioural scientists -

> have pointed to a variety of conditions in interpersonal relationships that are necessary to attain effective collaboration. Two of the most important of these conditions are that parties who are dealing with one another must learn to be open and frank about their positions - thus creating a climate of trust among parties, and that conflicts should be confronted and brought into the open rather than suppressed (through the power of one side) or avoided (by the tacit consent of all).

In summary, the problem of attaining effective organizational performance may reduce to the question of facilitating integration without sacrificing the needed differentiation.

In their study the primary effort was directed to the supposition that "different external conditions might require different organizational characteristics and behaviour patterns within the effective organization".

Questions raised by their studies, and also those of Woodward (1958) and Burns and Stalker (1961), are:

1. How are the environmental demands facing various organizations different, and how do environmental demands relate to the internal functioning of effective organizations?
2. Is it true that organizations in certain or stable environments make more exclusive use of the formal hierarchy to achieve integration, and, if so, why? Because less integration is required, or because in a certain environment these decisions can be made more effectively at higher organizational levels or by fewer people?
3. Is the same degree of differentiation in orientation and in departmental structure found in organizations in different industrial environments?
4. If greater differentiation among functional departments is required in different industries, does this influence the problems of integrating the organization's parts? Does it influence the organizational means of achieving integration?

Lawrence and Lorsch (1967)

At the same time Lawrence and Lorsch felt it necessary to consider two questions relating to the resolution of inter-departmental conflict.

These were:

1. What factors within the organizational system determine whether managers deal effectively with interdepartmental conflict?
2. Are these determinants of effective conflict resolution more likely to be present in the organizations that are both highly differentiated and highly integrated than in those which are less so?

As a result of the studies conducted by these researchers the following points of interest were observed relating to integration and conflict resolution. Firstly with regard to the place of the most effective integration within an organization, it was noted that:

> Given the uncertainty about both the market and scientific phases, and given the fact that the effective integrator had to know something about all facets of the environment, the top managers we interviewed indicated that the integrator had to be at the lower management levels in order to have the knowledge required to carry out the detailed integrating activity that the environment demanded.

and the upper managers job "was to provide integration at a broader level of policies and strategies".

Six factors were recognized as significant determinants of effective conflict resolution:

1. Intermediate position of integrators.
2. Influence of integrators (a persons influence can stem from a number of factors - the formal position he occupies, his expertise or competence, or perhaps his age or length of service).
3. Reward system for integrators.
4. Total level of influence (all managers considered).
5. Influence centred at required level.
6. Modes of conflict resolution -
   (a) best by confronting conflict and getting the best solution;
   (b) second by reaching a compromise;
   (c) third by smoothing over the conflict;
   (d) using power to influence the decision comes last.

Their study also lead to the conclusion that -

> the states of differentiation and integration in effective organizations will differ, depending on the demands of the particular environment. In a more diverse and dynamic field, effective organizations have to be highly differentiated and highly integrated. In a more stable and less diverse environment, effective organizations have to be less differentiated, but they must still achieve a high degree of integration.

Exposition of a Theory

As a result of their study Lawrence and Lorsch claim to have found an important relationship among external variables (the certainty and diversity of the environment, and the strategic environmental issue), internal states of differentiation and integration, and the process of conflict resolution. They have therefore proposed a Contingency Theory of Organizations which has as its under-lying assumption that organizational variables are in a complex inter-relationship with one another and with other conditions in the environment.

They suggest that if an organization's internal status and processes are consistent with external demands, the findings of their study indicate that it will be effective in dealing with its environment. More specifically, they found that "the state of differentiation in the effective organization was consistent with the diversity of the parts of the environment, while the state of integration achieved was consistent with the environmental demand for interdependence".

Their findings also indicate that the states of differentiation and integration are inversely related - the more differentiated an organization, the more difficult it is to achieve integration. In order to overcome this problem, they suggest that the effective organization should have integrating devices consistent with the diversity of its environment.

Practical Applications

The approach of Lawrence and Lorsch, in particular their idea relating to the measurement of factors in the environment to which the organization must relate, was met with considerable enthusiasm amongst social scientists involved with organizational problems, e.g. Lupton (1971). He sees their work

> as an attempt to get away from vague talk about organizations and systems in environments and loose biological and physical analogies, and to make the concepts of environment and organization operational and measurable. Having done so they make good use of previous work to suggest hypotheses that might be matched against the facts collected in comparative study.

This makes it possible to set out the questions which must be asked and steps to be followed in redesigning an organization's structure for better performance, not only to a new organization but to continuous monitoring of the relationship between any organization and its environment to maintain high performance.

Despite the widespread enthusiasm with which this line of organizational research has been greeted, the efforts of Lawrence and Lorsch, and others in their school, should be recognised as pioneering. Tosi *et al* (1973) have indicated that this approach is sensitive to errors in measurement of the contingency variable, e.g. situational favourability, environmental uncertainty, technology, etc.

II A THEORY BASED ON OPEN SYSTEMS OF ACTIVITIES AND THEIR BOUNDARIES

An approach very different to that used by the writers of the 'contingency' school has been used by Miller and Rice (1967) to develop a theory of organizations. It is interesting to note that this work was published in the same year as that of Lawrence and Lorsch previously dealt with in this chapter. While the "conceptual framework" of their theory is presented in an abstract manner, in general the impression given is that of an essentially practical approach. This is not to condemn the work of Lawrence and Lorsch, who also profess the basic conception of organization as an open system, (1967), and the practical applications of their work. The distinction would appear to result from the fact that while the latter are essentially research workers, Miller and Rice are professional consultants in the management field. Their studies have been carried out with the object of improving the performance of enterprises by attending to the effectiveness of the organization. Rather than approach these problems from the environmental influence viewpoint they have looked at the internal systems of the organization.

In developing a basic theory they have given attention to concepts which have developed from both the classical and human-relations schools of organizational theory. Their expressed aim was to "develop a theory that reconciles tasks, human activities, and organization within one general framework". By doing so they hoped to extend understanding and facilitate control of the inter-dependence between the social and technical variables of organization. They note that their conception of organization, as a tool designed primarily for task performance, required that human needs - satisfaction and defence against anxiety - should be regarded as constraints on task performance.

Hence the inevitable compromise between technical and human needs when applied to practical organizational problems, especially when social or technical change required accommodation. Based on this conception, they had formerly assumed that in the optimum organization the human groups required for task performance were always identical with those which satisfied the social and psychological needs. It had then been realised that there were "settings where elegant solutions of this kind cannot be found, or when, if found, they introduce new and intractable constraints".

There has been a need to reconcile 'task-centred' and 'person-centred' views of organization. A major difficulty in this is seen by Miller and Rice to be primarily that organization for task performance is a co-ordination of activities - but only some of the activities of any one human being are directly relevant to task performance. For this reason task organization can be seen to be independent of membership and survive changes in membership. However there is always the aspect that a human being's other activities, attitudes and beliefs, can help or hinder task performance, and it is the "needs and activities of existing role incumbents that determine the attitudes of working groups towards change, and hence may generate resistance to change".

Miller and Rice develop two major themes. The first is that the situation in which the distinction of a social organization from a task performance organization is unnecessary due to the satisfaction of human needs by the task performance, is a particular case - an exception rather than the rule. In their terms, this occurs when

the boundaries of task systems and sentient systems coincide.[1] A more general proposition is that any enterprise requires three forms of organization - the first, to control task performance; the second, to ensure commitment of its members to enterprise objectives; the third, to regulate relations between task and sentient groups.

Before dealing with the general organization theory which they have developed it is worth examining the manner in which they have developed their basic concepts.

Their basic conception of the organization of any enterprise is as an open system which can be characterized as existing by exchanging materials with its environment. The system has a boundary which is in effect a region between the internal processes of the enterprise and its environment in which boundary control activity must take place. Within the system there are a number of processes and activities. An enterprise relates to its environment through a variety of import-conversion-export processes, which require a corresponding variety of activities.

The Human Element in Organizational Theory

The deployment of human resources is a common requirement in all enterprises. Hence Miller and Rice see any theory of organization as requiring a theory of human behaviour as well as a theory of systems activities and boundaries.

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1 *Sentient* is used to describe groups with which human beings identify themselves. A sentient group is one which demands and receives loyalty from its members - this may or may not be distinct from a task group. Hence sentient systems - systems of sentient groups. An effective sentient system relates the members of an enterprise to each other and to the enterprise in ways that are relevant to the skills and experience required for task performance.

Again they see an individual or group as an open system, which can only exist through processes of exchange with environment. The significant factor with human resources, individually or groups, is that they can mobilize themselves at different times into many different kinds of activity system. A characteristic which must be allowed for is that only some of these activities will be relevant to the performance of the tasks and the enterprise to which they belong. The individual, the small group and the large group are seen as progressively more complex manifestations of a basic structural principle. Each can be described in terms of an internal world, an external environment and a boundary function that controls transactions between what is inside and what is outside.

Intergroup Transactions

In an open system it is necessary to have engagement in intergroup transactions. This involves the drawing of new boundaries at least temporarily. The result is of risk to each group involved, as relationships involved may become favoured by individuals above those of their original group. Thus familiar boundaries including weaker family relationships may be weakened or even destroyed. Another risk is that the greater the number of members who represent the group, the greater the chance of inconsistency.

Task Priorities and Constraints

The task of any enterprise can be defined generally as to secure a pay-off by converting intakes into outputs, the minimum pay-off being the postponement of its demise. But even simple enterprises have multiple intakes and outputs and hence perform multiple tasks. The foundation of the theory of Miller and Rice is that at any given time an enterprise has a *primary task*, the task that it must perform if it is to survive.

The primary task makes it possible to construct and compare different organizational models of an enterprise based on a different definition of its primary task, and to compare the organizations of different enterprises with the same or different primary tasks.

The definition of the primary task determines the dominant import-conversion-export system and thus the operating (as distinct from maintenance and regulatory) activities. It specifies the resources required and hence determines the priorities of constituent systems. Identification of the primary task in an enterprise may be problematical in that the complexity of activities may appear of different levels of importance from different viewpoints. Usually the well known identity and purpose of an institution assigns long-term priority to a particular task. However in many organizations, tasks that are normally ancillary to the primary task may become primary, e.g. a maintenance system. The primary task is not a normative concept. Not every enterprise must have one, but Miller and Rice propose that at any given moment in every enterprise, one task is primary.

Resources and Constraints

The extent to which resources exist or do not exist constitutes the major internal constraint on task definition and performance. Resources must therefore be an important consideration in the design of an organization.

The social, political, economic and legal conditions of the environment constitute the major environmental constraints. Miller and Rice suggest that, because the members of society create its culture and hence bring to the enterprise where they work the cultural constraints of their society, environmental constraints are inevitably built into enterprises. When an enterprise is itself valued both by

its employers and by its society, the constraints on task definition and performance attract value as well, and become for this reason difficult to change.

Constraints Imposed by the Employment of Human Resources

The nature of human behaviour in groups dictates that, however much an employee accepts the definition and methods of performance of an enterprise's primary task, it is unlikely that the values attached to his membership of other groups will always be in harmony with those of the primary task. Human needs may modify task requirements - "on the scales of task-system efficiency are superimposed scales of human satisfaction and deprivation". It is suggested that for some tasks it may be possible to construct organizations so that not only do work-group boundaries coincide with task boundaries, but membership of the resulting work group provides considerable satisfaction for its members. In other words, work organization is not uniquely determined by the technical system and alternative organizational models may be available. However, Miller and Rice consider that the organizations in which it is possible to match sentient groups to tasks, and so make task and sentient boundaries coincide, are the exception rather than the rule. They consider that a group which does share its sentient boundary with that of an activity system is likely to become committed to that particular system. The short term result may be greater efficiency and satisfaction but the long term effect might be to inhibit change which could occur through technical advances.

Organizational Model-Building

Based on the concepts outlined above, Miller and Rice have shown how it is possible to construct models of organization. Organization is defined as the patterning of activities through

which the primary task of the enterprise is performed. Thus the optimum form of organization is that which best fits the requirements of primary task performance, but must take account of the human, physical, and technical resources available for task performance, and the human, political, economic and social constraints on task definition.

Having first identified the dominant process, that related to the performance of the primary task, it is then necessary to discover the discontinuities in the process which mark the boundaries of systems of activity. This may involve several orders of differentiation in a large enterprise. Miller and Rice make use of diagrams, in topological form, to illustrate organizational model building based on activities and their systems. This technique is illustrated using an enterprise containing six constituent systems e.g. a Chemical-cum-Textile manufacturer, in Figure 1. This framework offers a number of organizational models based on technological differentiation. First order differentiation between chemicals and textiles with second order differentiation under purchasing, manufacturing and marketing is shown in Figure 2. First order differentiation between purchasing, manufacturing and marketing, with second order differentiation between chemicals and textiles is shown in Figure 3. Figure 4 indicates one of the possibilities of mixed dimensions of differentiation - a first order differentiation into a purchasing section with second order differentiation between chemicals and textiles, two separate first order manufacturing systems and a combined first order marketing section handling both chemicals and textiles.

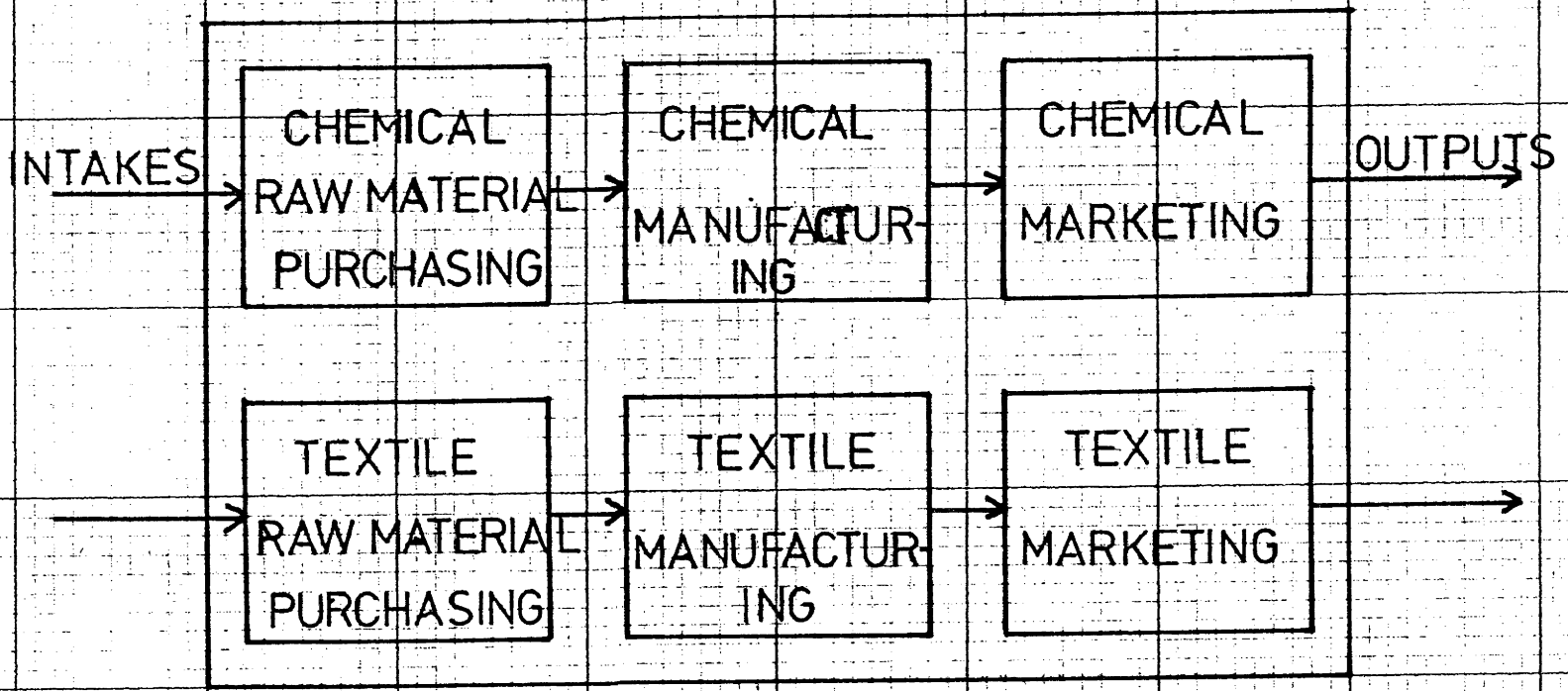

FIGURE 1.

Six constituent systems of a chemical - textile enterprise
(after Miller and Rice 1967)

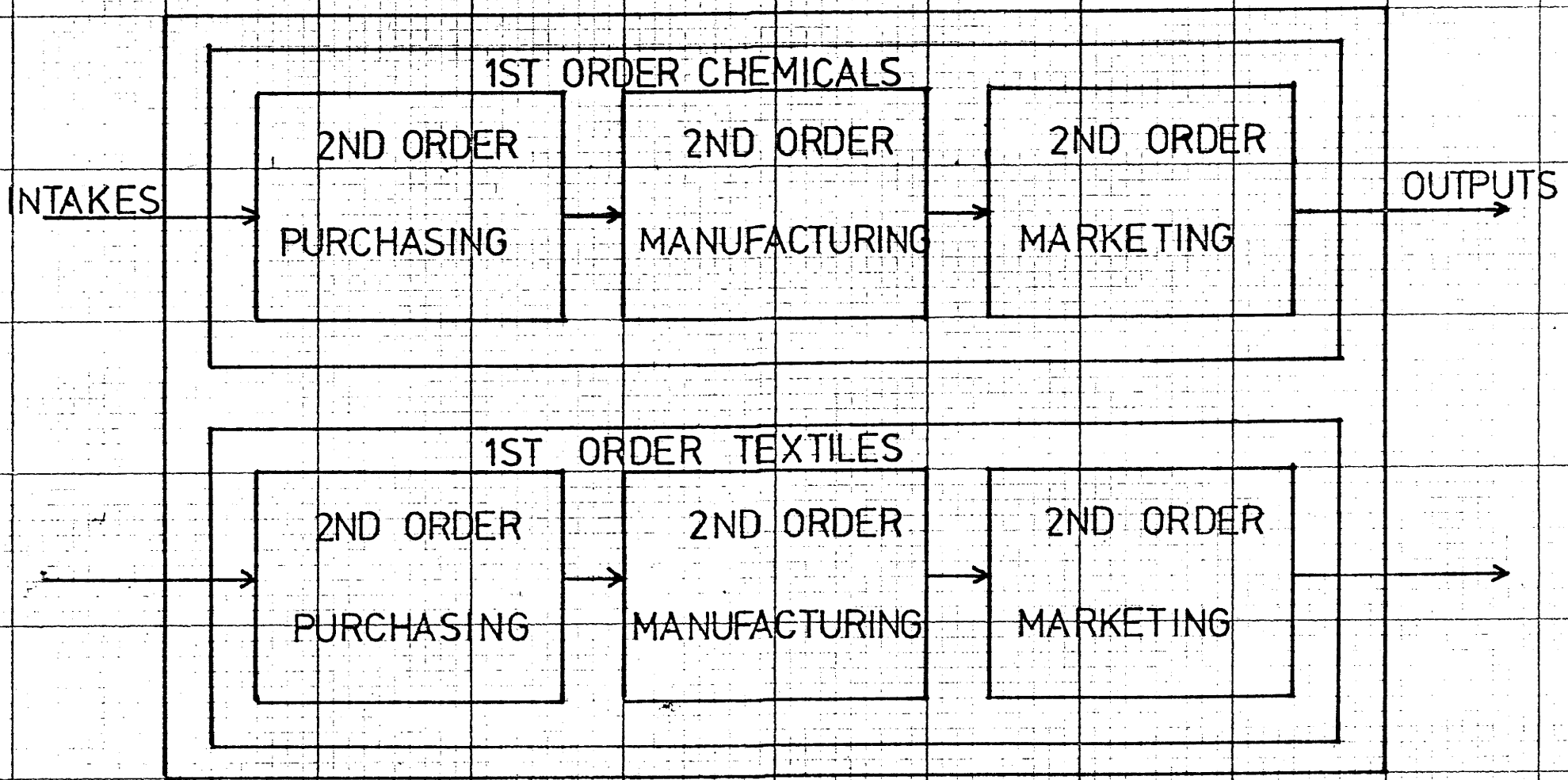

FIGURE 2.
Organization with first order chemicals and textile systems
(after Miller and Rice 1967)

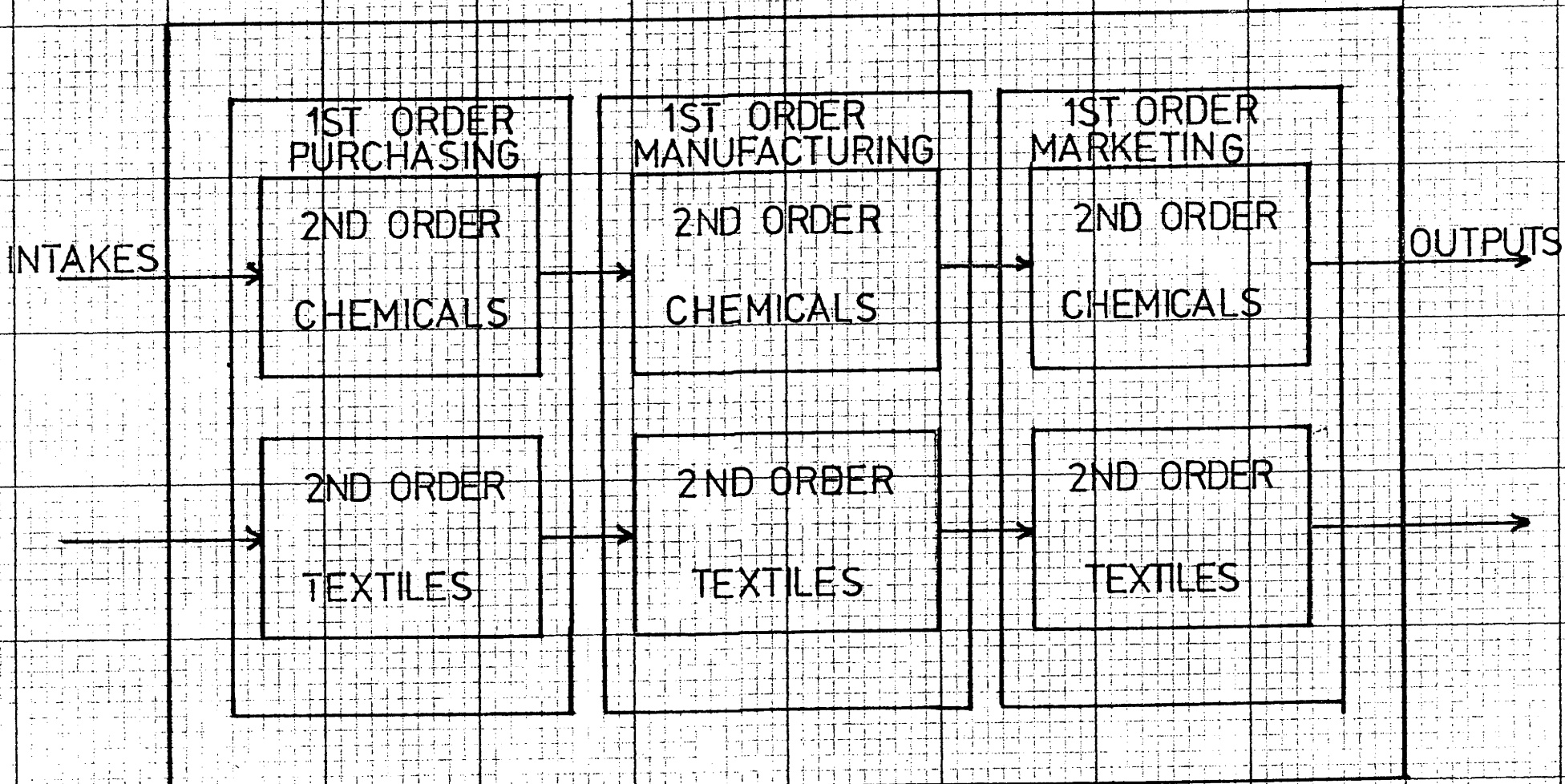

FIGURE 3.
Organization with first order purchasing, manufacturing and marketing systems. *(after Miller and Rice 1967)*

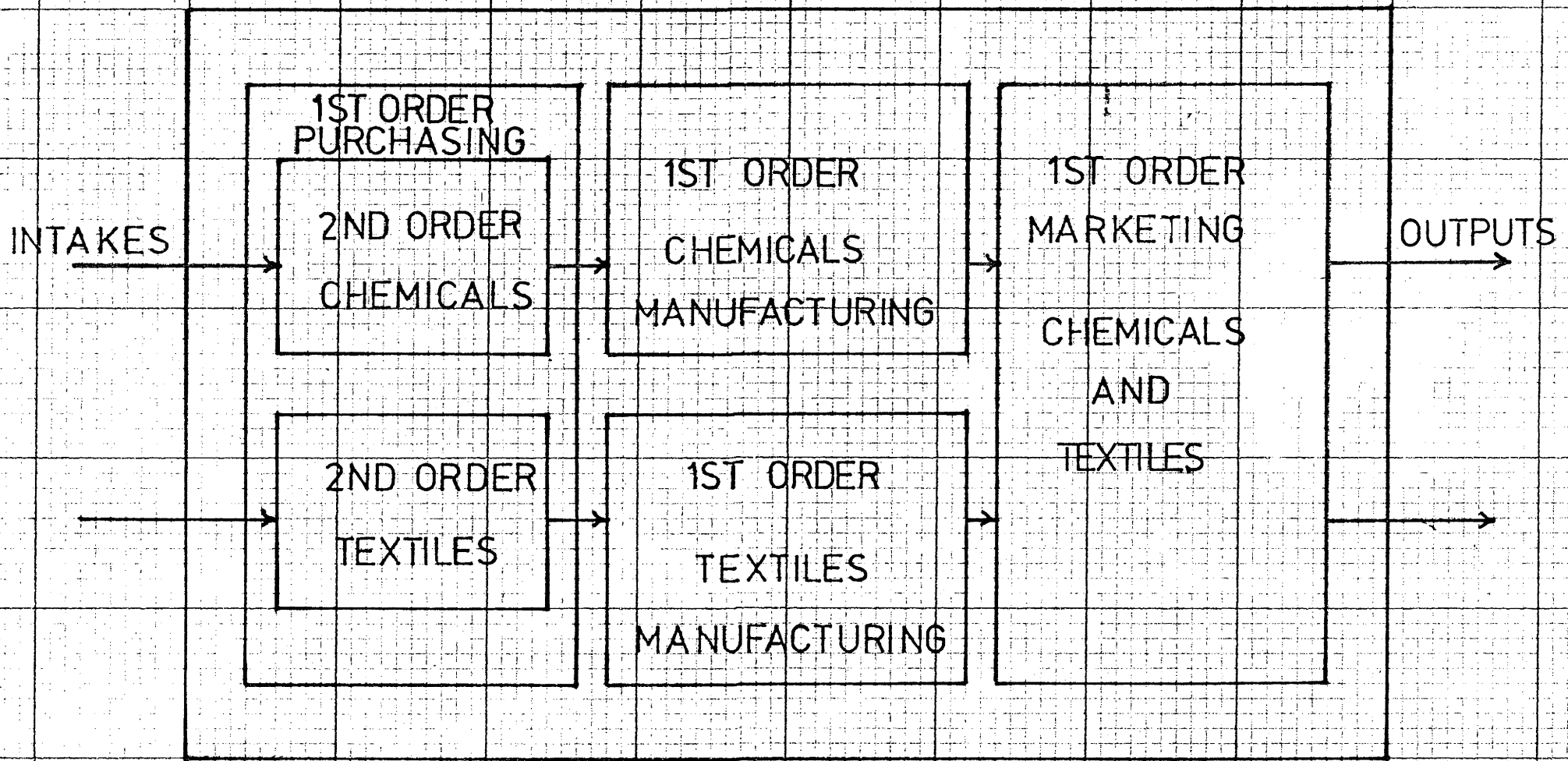

FIGURE 4.

Organization with mixed dimensions of differentiation

(after Miller and Rice 1967)

The system boundaries imply a boundary control function and hence a form of regulation. Boundaries should be imposed at points giving substantial discontinuity for greater ease of regulation, more elaborate regulating devices being necessary to preserve the differentiation between systems where the discontinuity is slight. Boundaries may be imposed at points of no discontinuity where existing regulatory mechanisms are not capable of 'spanning' the system. In this case the boundary is determined by constraints not task requirements and is in fact a compromise solution.

The Managing System

Regulation of relations between the constituent systems, and between the whole enterprise and its environment cannot be contained within one of the constituent systems. Miller and Rice see such a system placed external to the operating systems as a managing system. Such a system will contain the regulation and maintenance systems of the enterprise. Where these are differentiated as discrete systems they will be also differentiated along with operating systems into second order regulating and maintenance systems. This has been illustrated in the topological manner in Figure 5, using our previous example of the Chemical-Textile manufacturing enterprise of Figure 2. This is a diagram of activity systems with double boundaries representing regions of control for inter-system activity. Such a diagram can be simplified by substituting a "transboundary region" for the continuous "boundary control function" region. This region can be conveniently used to define management command areas, and the region in whose boundary they occur represents an organizational boundary, as shown in Figure 6.

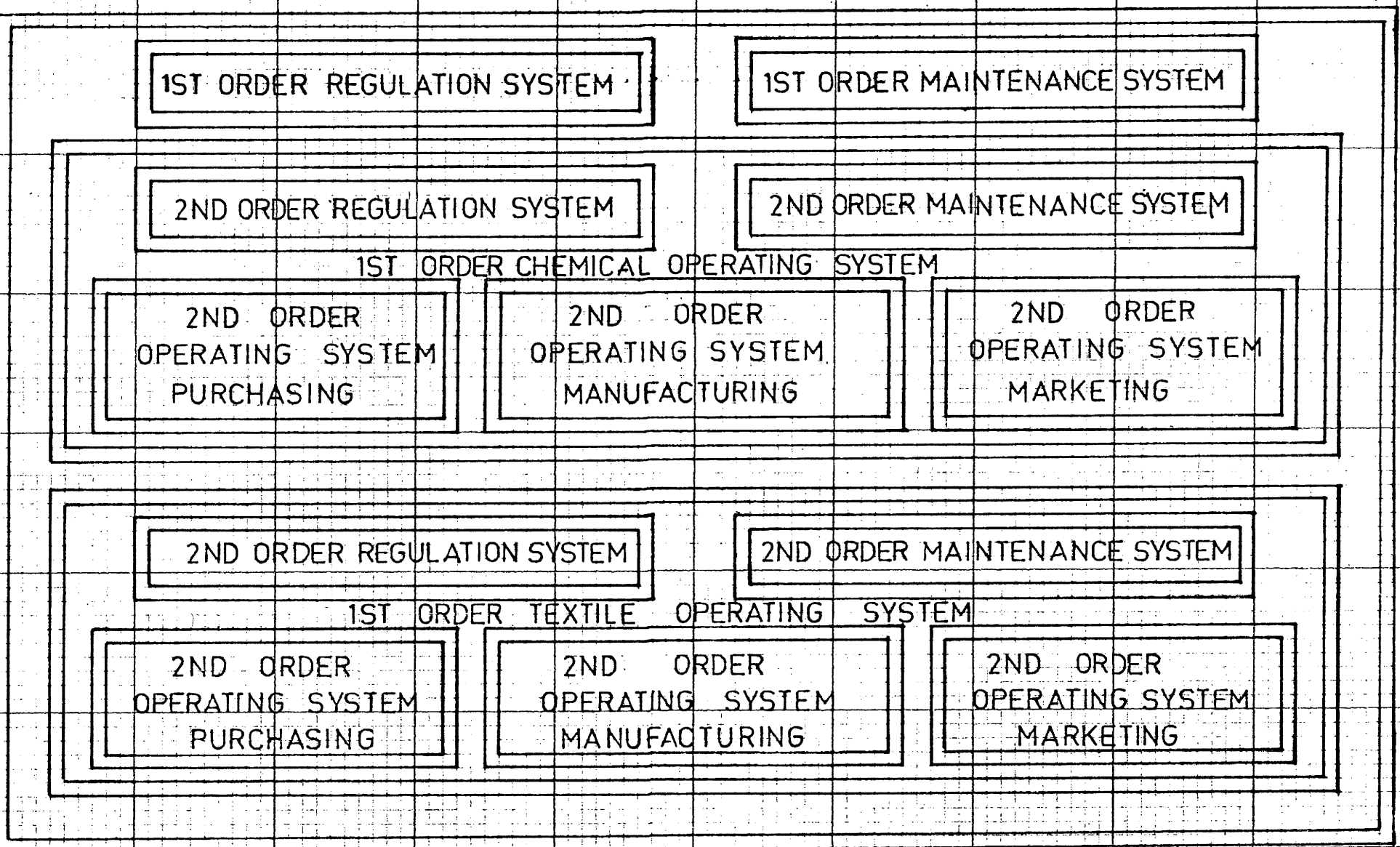

FIGURE 5.

First and second order differentiation of operating, regulating and maintenance

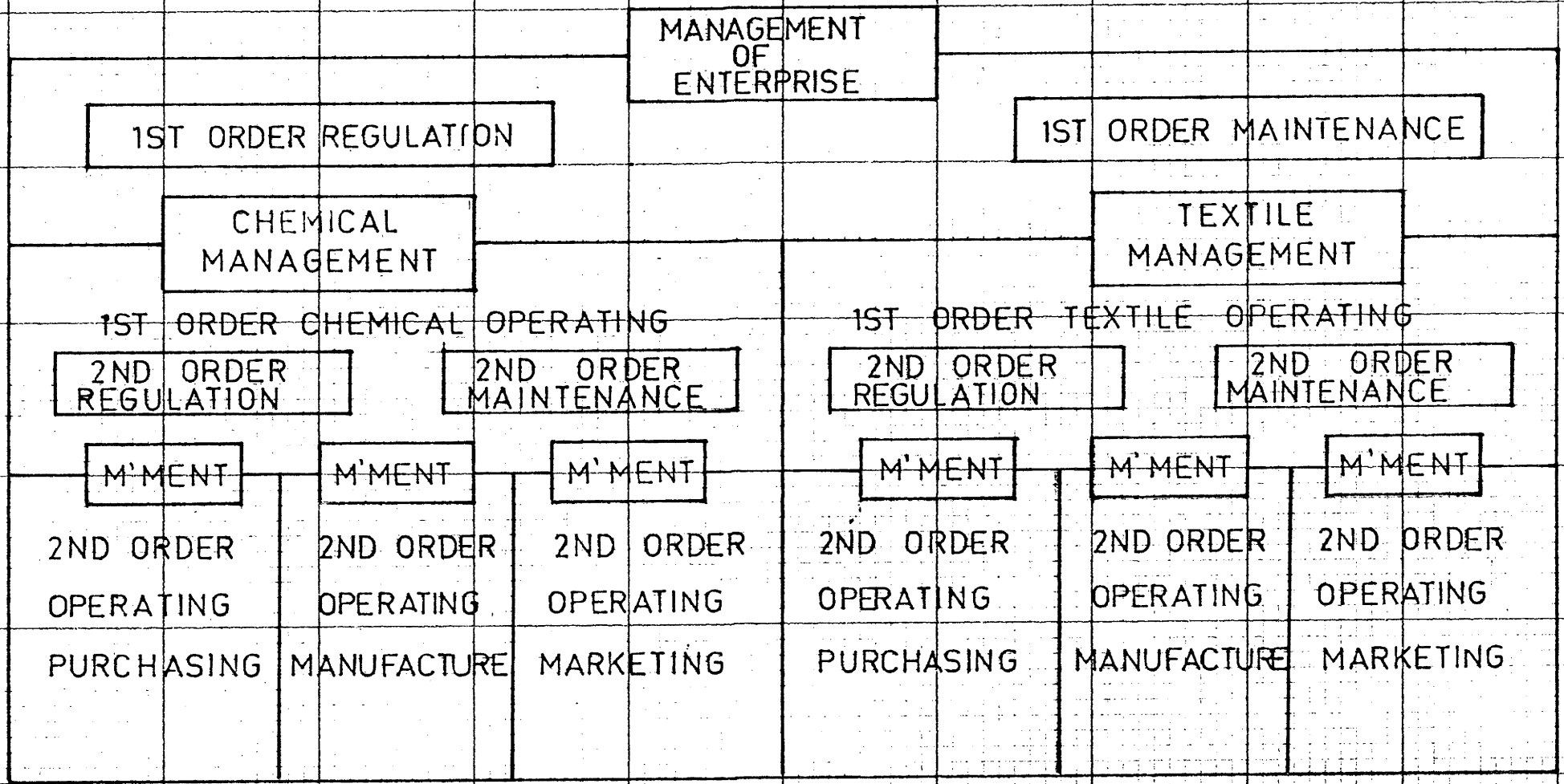

FIGURE 6.

Organizational boundaries showing management commands

(after Miller and Rice 1967)

Boundary Controls

Having recognized three types of boundaries which effect the organization's nature and performance namely task, organizational and sentient, Miller and Rice propose that management requires four kinds of boundary control. These are:

(i) regulation of task-system boundaries (i.e. regulation of the enterprise as a whole as an import-conversion-export system, and regulation of constituent systems of activity);

(ii) regulation of sentient-group boundaries (i.e. boundaries of the groupings to which people belong either directly through their roles in systems of activity, or indirectly through their role-sets. [1]);

(iii) regulation of organizational boundaries;

(iv) regulation of the relation between task, sentient, and organizational boundaries.

Miller and Rice make the generalization that without adequate boundary definitions for activity systems and groups, organizational boundaries are difficult to define and frontier skirmishing is inevitable. They suggest that it is a major paradox of modern complex enterprises that the more certainty with which boundaries can be located, the more easily formal communication systems can be established. This is because unless a boundary is adequately located, different people will draw it in different places and hence there will be confusion between inside and outside. In the individual this confusion leads to breakdown, in an enterprise to inefficiency and failure.

Towards a General Theory

Miller and Rice point to a tendency among those who have been concerned with both theory and practice of organizations to regard the organization of the production type process as central and typical.

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1 The 'role-set' refers to the association or group which an individual becomes involved with as a result of both his formal and informal activities - these may be expected to be strongly influenced by his appointed role in the enterprise.

The ideas of delegation and control that have emerged from this approach have become regarded as general laws of organization. Largely as a result, they consider the organizational charts of sales and research departments often appear to be designed more on aesthetic grounds to harmonize with the corresponding chart for the manufacturing department than to facilitate task performance.

To a large extent the value of their study appears to lie in their having drawn examples from outside manufacturing industry. Using their approach to organization theory through systems of activity and their boundaries they have shown clear distinctions between systems associated predominantly with conversion processes and those associated with import and export activities.

With conversion type activities the system is contained within the boundaries of the enterprise - thus the equipment and people involved are related to each other and the throughput within a bounded structure that has some degree of permanence. This is in contrast to systems of activity that cross enterprise boundaries, e.g., those involving transactions between suppliers and customers. There may be a two-directional exchange, against the uni-directional process of the conversion-type systems.

Miller and Rice use their concepts of differentiating between task and sentient groups to look at the organization of marketing activity, and the organization of the family business. In the former case, they show that the task system straddles an enterprise boundary and thus cannot be contained within the organizational boundary of the enterprise. In their terms, it is impossible for task and sentient systems to coincide. A managing system based upon factory production systems would tend to give a hierarchy which

would be much too simple and too inflexible to fit the complexities of such task performance. In the latter case, that of the family business, they show that task and sentient boundaries must coincide. The effectiveness of such an organizational form depends upon conditions of stability in its environment. In conditions of social, economic and technical change, commitment to the one group, in this case the family, can not only distort judgment about task decisions but more importantly lead to the disruption of sentient group relationships.

Of more concern to us is their attention to the problem of temporary and transient tasks within which we find the typical "project organization". It is this class of organization which they consider the most appropriate base for a general theory of organization. "The essential feature of a project type of organization is that the group has to be disbanded as soon as the task is completed". The authors draw examples of project organization from the construction industry and from research.

In modern forestry services the complexity of tasks and their associated research requirements provide the greatest challenge to organization. Project organization in particular may have special appeal in some situations. The social science of organizations has been increasingly involved with these problems in recent years, and some important contributions are examined in the following chapter.

CHAPTER FOUR

ORGANIZING FOR PROJECTS AND RESEARCH

> ... it is impossible to create at a particular point of time organizational structures, rules and regulations, duty statements, and so forth, that will meet all possible contingencies.
>
> Alastair Crombie (1973)

The organization of a research enterprise and of a project team share underlying characteristics which Miller and Rice (1967) see as being close to their general organizational type. In both, the primary task is clearly associated with a "conversion activity", but in the same managing system there are also essential import and export functions. There are however, important differences. While both are transitional or temporary organizations, in the project team the major problem of management is to integrate the activities of individuals and groups whose primary allegiance lies outside the specific project team. In contrast there is a strong tendency within research organizations for the boundaries of task and sentient groups to become coincident. Miller and Rice see the management problem there as one of making the boundaries of task and sentient systems more explicit, and of exerting greater control over them. If possible, task-oriented sentient groups should be created whose boundaries differ from those of the activity systems.

It will be apparent that "project type organization" can have a place in the large research enterprise, thus requiring an injection of management techniques very different to that of the traditional research organization. Research has tended to become

more "problem-centred" than "discipline-centred", and multi-disciplinary studies require multi-disciplinary teams.

THE IDEA OF MATRIX ORGANIZATION

Miller and Rice (1967) adopted the "project-type organization" as a basic form for a general theory of organizations. Over the past decade this type of organization has found rapidly increasing utilization in industry. This may be seen as the result of increasing pressures for early results in a social and technical environment of increasing rate of change. The adoption of such organizational structures, which in their more complex form are now widely known as matrix organizations, has required the adaptation of members to multiple lines of authority and responsibility. This has meant a direct conflict with the culturally stabilised idea of the single line hierarchy. There have thus been problems. Because of the short term nature of many projects for which this type of organization has been employed, there has been little compulsion for development of the most harmonious and humanly satisfying managerial techniques. Hence there has been a strong tendency to regress to the older (and more bureaucratic) style of organization as soon as project requirements were settled.

Kingdom (1973) has studied the development of project-type organization in the United States' government-sponsored aerospace industry. This study concentrates upon the character of interface relations between members of two disciplines brought together in the one task. The outcome is an exposition of a set of behavioural norms and codes which are required in a negotiated order for interface regulation.

The basis of this negotiated order is collaboration, which may be seen as a sophisticated form of behaviour whose maintenance requires careful and continuous cultivation.

While approaching his particular problem, Kingdom (1973) was confronted with the much wider problem which he has described as "Hierarchy meeting Technology". A number of the facets of this large scale problem of modern society we have already touched upon in the foregoing chapters. His approach may be considered to be an extension of the human relations school of writers, highly appropriate to the organizational problems of the present day. His investigation developed out of a concern for the human complexities involved in a matrix form of organization doing advanced research and development work in a turbulent environment. In this form linking of the processes of problem-solving and resource allocation places greater demands upon individuals. Two organizational forms are seen to be involved and the individual role is expanded from merely production to participation in definition and operation of both processes.

The basic management problem in a matrix form of organization appears to relate to the meeting of two or more hierarchies. Kingdom found a marked tendency for relationship attitudes (between the hierarchies confronting each other at a particular task) to vary with level of responsibility. The higher levels tend to take a more critical view of each other. The critical relationship is between problem-solving and resource-allocating management groups. Objective technical problem-solving is dependent upon mutual open-mindedness and trust, but there is room for negotiable elements in the rather subjective judgment required in allocating resources or assigning priorities. A dilemma is posed in the need to separate consciously these linked organizational processes, which leads him to suggest that in a complex organization (as in the matrix organization) there is the need for "a problem-solving complementarity to the resource-allocating hierarchy". Kingdom further suggests that the subversion of the needs

of either technology or the hierarchy will lead to segmentation in the total performance of the organization.

The Organizational Environment

An appreciation of environmental problems is essential in any consideration of the most appropriate organization. Kingdom has used the system of Emery and Trist (1965) to classify types of environment. This recognises four idealized types:

(a) Placid, randomized
(b) Placid, clustered
(c) Disturbed, reactive and
(d) Turbulent-field.

The environment of an organization may be considered as composed of influences or forces, each of which is the sum effect of the interaction of an individual, group, or component of another organization with it. These various forces may further be considered as being of positive or negative value to the organization, as goods or bads, or in Emery and Trist's terms, goals and noxiants. In the first part of their dichotomous classification the forces of the environment are 'placid', in that they are unchanging. This class is further divided depending upon the distribution of the forces, randomized or clustered. This variation in nature of distribution effects the decision making required by a particular organization - obviously with a random distribution of positive and negative influences the decision on which way to move cannot be seen as significantly effecting the advance of the organization. In a clustered environment this will not be the case.

The other part of the primary dichotomy is distinguished from the first in that there are present (in proximity) more than one organization (system) of the same kind, i.e. requiring the same kind of 'sustenance' from the environment and hence competitive with each

other. To reduce the complexity of this type of classification this second part of the primary dichotomy may also be considered as having a clustered distribution of other forces. This class is then differentiated depending upon the nature of these forces. If they are stable we have the Disturbed Reactive Environment and if they are changing we have the Turbulent-field Environment.

In the turbulent-field environment organizations find collaboration necessary as well as competition, in their adaptation to "persisting areas of technological uncertainty". Put into more specific terms we might consider an objective which, because of its complexity requires the involvement of a number of organizations each handling different facits. Because of technological development and change each organization is faced with uncertainty, but this all contributes to the environment of the particular objective, and hence the interdependence of the individual organizations. Kingdom (1973) has described the response to the turbulent environment as follows:

> Typically, each organization sets up a special 'project organization' to ensure adequate interconnection among the organizations. The role of this specially constituted organization within an organization is different from that of the normal, i.e. vertical, decision-making hierarchy. Its role within an organization is to conduct lateral commerce between dissimilar organizations which are jointly attempting to solve complex problems; the role of the vertical decision-making hierarchy, on the other hand, is to maintain the autonomy and integrity of the organization as a separate entity.

The overall result of such 'mingling' of organizations is the matrix form.

In a turbulent-field environment there is the virtual removal of any clear-cut areas of decision-making responsibility. Thus there arises the need for "organizational adaptation to complexity and uncertainty". Kingdom considers two things are necessary for organizational adaptation in these circumstances. One is an understanding

of the turbulent-field environment and the other is a strategy for 'active' rather than 'passive' adaptation.

Passive modes of adaptation, in Emery's (1967) terms, are suggested as being essentially defensive mechanisms in the face of complexity and uncertainty. They have been defined as follows:

1. Segmentation: When a situation becomes too complex for organized, meaningful learning, vertical disorganization occurs. This means that the top and bottom of the organization tend to become increasingly disjointed, and various levels of the organization tend to pursue goals according to their individual perceptions of reality.
2. Fragmentation: In meeting complexity, ends and means become confused. Over time, there is a lack of goal continuity, particularly during periods of rapid change when there is a need to redefine organizational mission.
3. Dissociation: As an organization differentiates to cope better with complexity, lateral disorganization occurs. Thus parts of the organization pursue their own ends without respect for the integrative needs of the total system.

Active adaptation is a more demanding strategy for an organization to take in that it involves giving consideration to future (and unknown) environmental conditions and organizational mission. In Kingdom's words:

> ... an active response not only takes into account the initial conditions of an environmental nature but also considers the subsequent conditions of the organization and the implications that the choice of response will have on it. Thus not only is the response adaptive to the environment, but also the organization is afforded a greater range of choice for other purposeful goal activities.

Such a process must be an important consideration in organizational design - i.e. to look for possibilities of transforming a given environment rather than the relatively negative process of merely adapting to it. Human values - a response to persisting areas of relevant uncertainty (Emery, 1967), should also be considered along with organizational philosophies in this context. Kingdom has referred

to Trist's (1968) illustration of the relationship between changing philosophies and values in the "post industrial society" of most advanced countries:

	Emphasis changed	
Social Pattern	from	toward
Cultural values	Achievement	Self-actualization
	Self-control	Self-expression
	Independence	Interdependence
	Endurance of distress	Capacity for joy
Organizational philosophies	Mechanistic forms	Organic forms
	Competitive relations	Collaborative relations
	Separate objectives	Linked objectives
	Own resources regarded as owned absolutely	Own resources regarded as also society's

He sees as consistent with these changing trends in values and philosophies the basic principle of organizational design for a self-regulating system as defined by Emery (1967), namely, for a population to choose between seeking to enhance its chances of survival by strengthening and elaborating special social mechanisms of control or by increasing the adaptiveness of its individual members. Kingdom claims that the matrix organizational form recognizes both strategies. The principle entails the development of effective internal decision-making structures to set and reset its functioning, and requires the establishment of mechanisms of mutual adjustment based upon shared values amongst members. This can be seen to be largely in line with the ideas enumerated by Miller and Rice (1967) with regard to their "project-type organization". Kingdom looks at matrix organization as an attempt, in an abstract way, to ensure the survival of the organization as well as of the society concerned. He considers the design of the matrix organization to incorporate two design principles:

> First, it is a hierarchy based on a principle of organizational design arising out of economic theory and free enterprise.
>
> Second, the matrix design is part of a complex problem solving system based on an organizational principle arising out of a growing technology for problem-solving, sometimes referred to as systems engineering.

An important feature is that both principles, or organizational purposes, may not always be in accord - rather they tend to be in conflict, and hence conflict resolution is seen as a necessary part of the matrix organizational form. These two principles require two organizational structures. Kingdom refers to them as the functional structure and the project structure.

The application of this mixed organizational form is primarily towards the development of a goal which cannot be accurately described beforehand. The nature of the turbulent-field environment is such as to preclude any straight-forward disclosure of active alternatives or their consequences. The responsibility for dealing with action to achieve such an uncertain goal is shared by both project and functional management. Each functional manager is primarily involved in the best application of the particular specialty of his function or discipline. The total complex project results in considerable interdependence between functions involved and the supervision of 'trade-offs' between functions is the duty of the project manager, who generally must define what is to be done. This authority required by the project manager results in a network of authority being superimposed on the preexisting authority networks of the functional hierarchies involved.

Most of the problems involved in this form of complex organization stem from this feature of a dual or multiple authority structure for each individual.

> For the people working in a matrix organization which had many projects going at any one time, the result could be and frequently was, chaotic. Almost simultaneously, anyone in the organization could be working in a number of suborganization project structures and in the main functional structure. It is not easy for anyone who is accustomed to a simple hierarchial structure to work in this type of organization.
>
> Kingdom (1973)

Another feature of matrix organization where highly technical specialties are involved is the considerable degree of participation required by employees. This can be an additional complicating factor in overall management, requiring in Kingdom's words, "an enlightened breed of manager". While holding responsibility for the results, largely innovative, produced by his team, he is dependent on their participation and must have faith in their choice of the best approaches to alternatives in the highly technical problems commonly involved.

Considering that turbulent-field environments have had their major impact on organizational development for little more than a decade, it is not surprising that methods of control in matrix organization should still be wanting. Kingdom suggests that the traditionally accepted concepts of hierarchically structured organizations are no longer viable in this context. Emery and Trist (1965) consider that the use of the matrix form of organization helps to transform the turbulent environment into the more simplified clustered or disturbed-reaction types of environment which we have mentioned previously. By so doing, the individual organizations, in a transformed environment, will still be able to achieve their own required degree of stability. This process has been pictured by Kingdom (1973), as an expanded decision-making process as shown in Figure 7 . It involves a split in functions between organizational purposes that has the effect of reducing environmental uncertainty, a prerequisite for the second

TURBULENT ENVIRONMENT		CLUSTERED OR DISTURBED REACTIVE ENVIRONMENT
Obtaining and transforming information in interaction with other organizations in a cluster	Enviromental transformation	Deciding on strategies, operations and tactics within the transformed environment for survival and growth of the individual organization
EXPANDED DECISION MAKING PROCESS		

FIGURE 7.
Expanded decision-making process (after Kingdom, 1973 p. 27)

stage or organizational purpose. The functions and purpose of the two stages are as follows:

Structure	Function	Purpose
Project structure	Reduction of uncertainty	Transformation of turbulent environment
Functional structure	Assessment and containment of risk	Achievement of stability within the transformed environment by strategies, and operational and tactical decisions.

RESEARCH ORGANIZATIONS

"The primary task of research work is the creation of knowledge" Miller and Rice (1967). Thus the basic intake is seen to be questions This leads to a primary characteristic of research institutions which is that they have a strong tendency to generate their own intake. This characteristic can be seen as leading towards the formation of a relatively closed system, and intakes from the environment tend to be crowded out by the self-generated questions. Such a tendency creates problems for a number of reasons. In the first place the nature of research institutions is such that they depend for their maintenance and support on a sponsoring entity in the environment, and hence must be expected to operate as an open system. Without the exposure to relevant parts of the environment the capacity for creative problem solving will diminish. A common problem to all research institutions would seem to be: "to steer between the Scylla of creative research activities that are irrelevant, and the Charybdis of relevant research activities that are uncreative." Miller and Rice (1967). The nature of the flow of work in a typical research enterprise is illustrated in Figure 8.

Resources and Constraints in Research

The resources required for task performance in the research organization are human and physical. The former is of primary

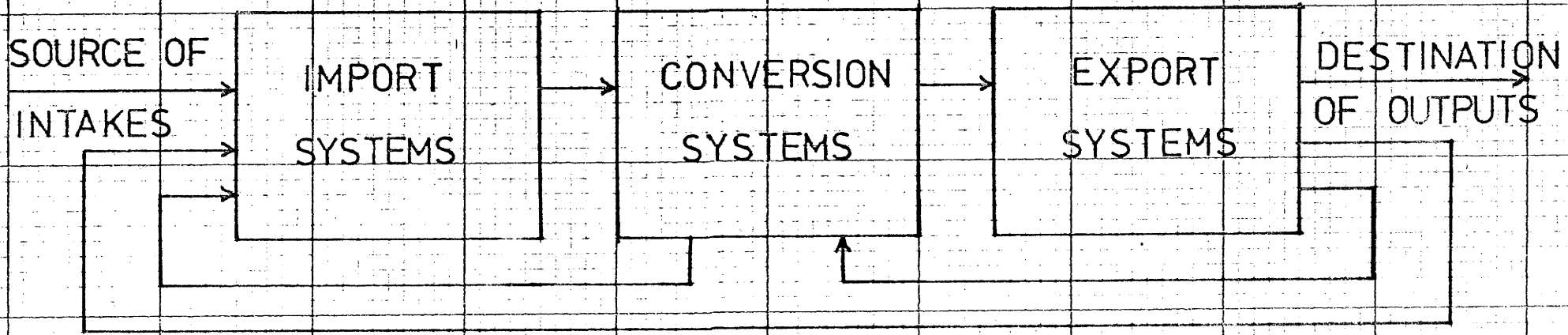


FIGURE 8.

Dominant import-conversion-export process of an institution of research

(after Miller and Rice 1967)

importance because of its specialist nature - scientists and technicians. The latter is composed of space e.g. laboratories, plus equipment and supplies.

The major constraints on research work are the capacity and availability of these resources, and of time, money, and the social and legal conditions of the environment.

Research enterprises vary in their dependence upon the environment, yet all must feel the effects of economic social and legal constraints. The effects will be felt particularly in the nature and extent of intakes and outputs. Control over research activities by the environment can be considered in terms of the nature of protection which a research institution can give to its members and their work. Miller and Rice (1967) have recognized three levels of protection:

(a) Complete: in this case the problem is adequately formulated, there are no restrictions on experimental materials and no constraints imposed by the source of data or the environment on the publication of results.

(b) Limited: here the problem may be adequately formulated but access to data is subject to environmental control and publication is dependent upon acceptance by the relevant parts of the environment.

(c) Professional: in this class the problem is only partially defined and access to data is subject to stringent conditions. Publication is subject to clearance from the source of data. Research workers involved must be prepared to accept professional responsibility for the results or their consequences.

A Research Organization Model

While there are many indefinite features of an organization adapted to a research institution a large part of the importance which Miller and Rice place on this type of organization must be largely due to its flexibility. As indicated above the basic features of any organization - based on the import-conversion-export system approach developed as a means of analysing and modelling

organizations - are present here. The temporary or transitional nature to which it is fitted lend it to adaptation to meet any organizational task. Thus it is readily conceived of as being a basic organizational form.

The boundaries between import, conversion and export systems in a research enterprise are difficult to define, hence much of the control of import and export processes is likely to be included in an undifferentiated conversion system. Within the conversion system the boundaries of operating systems are determined by the technical conditions necessary to answer a question or solve a particular problem. These boundaries will be reinforced by territorial differentiation if data occurs in specific places, and by time differentiation, if data is to be taken at specific intervals for example.

When the solution to any question is found (assuming it can be found) the operating system involved ceases to exist and the groups of scientists and equipment which were involved must disperse, to reform for another task. This factor necessitates that firstly the form of the organization be technologically determined and secondly that it be flexible. This is the nature of the "project-type organization".

Within this type of organization, as commonly employed in research institutions, a form of segregation of projects into 'programmes' is commonly practiced. A programme may be defined as a group of projects sufficiently discrete to permit being separately led, but sufficiently close to be parts of a larger integrated 'programme' under common leadership.

In Figure 9 the pattern of management for a research organization has been illustrated, using the simplified diagram previously

developed in Figures 5 and 6. Each box must be taken to represent various management and leadership activities not necessarily an individual, and an individual may participate in more than one activity. Thus institutional management may consist of an individual, who may have this as his sole or major responsibility, or of some or all of the project and programme leaders. While further subdivision, i.e. within projects, is possible the proliferation of levels of management thus created would not only reduce organizational flexibility, but also tend to be inconsistent with the accepted egalitarian culture of scientific research.

The organizational structure as illustrated in Figure 9 is recognised as having its problems. If projects are, as likely, multidisciplinary in nature, individual scientists can become academically isolated. Rather than have the emergence of informal groups the organization may provide for institutionalized and stable sentient groups. This is dealt with in the following section.

Managing Systems in the Model Research Organization

The primary task of the managing system is to control the internal environment and its transactions with the external environment in order to maximize the performance of the organization's research staff. It is usually an added necessity for management to ensure the relevant parts of the external environment are satisfied so as to ensure continuation of support from both financial and scientific authorities.

Internally, the managing system has to control, co-ordinate and service the operating systems and provide resources so as to match internal and external requirements. But the major internal problem is to secure flexibility of the operating systems - assembling appropriate scientists and equipment for each project and dispersing them as each project is completed.

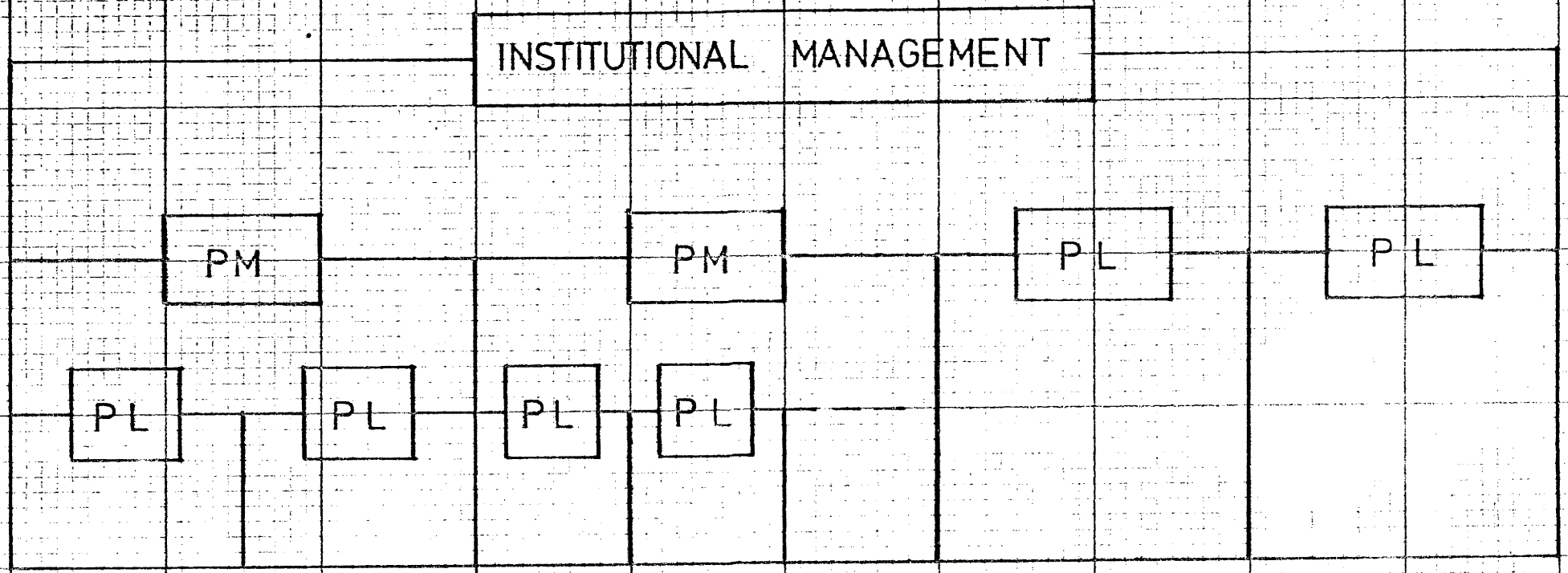


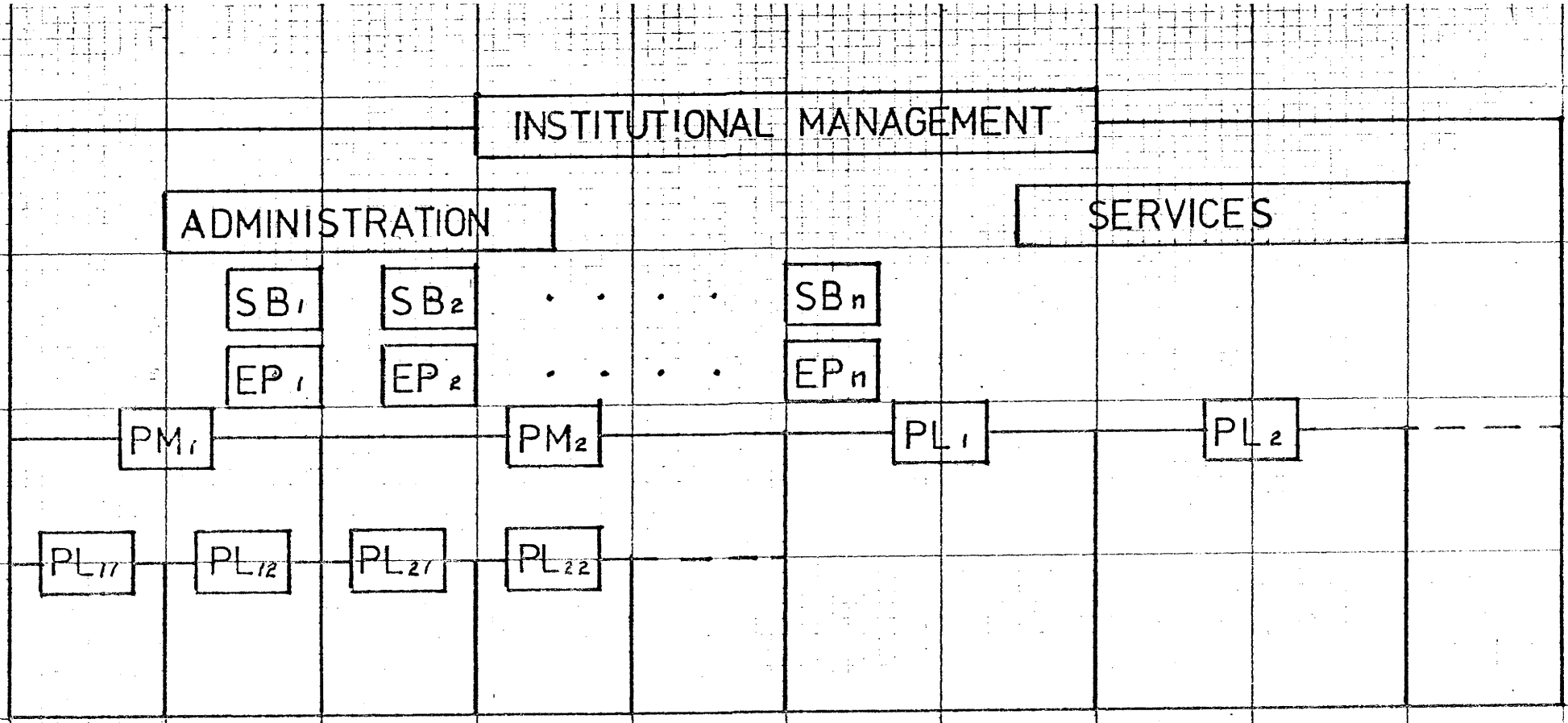
FIGURE 9.
Organizational boundaries and managing systems for a research institution. *(after Miller and Rice 1967)*

Obviously the organization itself should facilitate the disbanding and reforming of programme and project groups and their equipment, while at the same time providing for the maintenance of scientific skills.

Miller and Rice (1967) suggest that an institution should provide specialist 'bases' to which every scientist will have an affiliation (dependent upon his particular speciality) no matter what programme or project he is connected with from time to time (i.e. various task groups). The base is thus to provide the essential sentient group which will have a characteristic of permanence, in contrast to the various task groups. By providing such bases, the research institution is able to incorporate some of the commitment that would otherwise belong to external scientific and professional associations. Science-centred leadership is thus incorporated as a compliment to problem-centred management. Figure 10 illustrates this feature.

As in Figure 9 the boxes in the diagram indicate activities rather than individuals. However it is noted that normal expectation is that each box represents a role to be filled by one individual, as his only or at least principal role. In scientific research this expectation is reinforced by the tradition that 'management' should be in the hands of an eminent scientists. Commonly the staff of an institution is built around such a person, and its reputation is accordingly highly personalized.

The role of the eminent scientist-cum-manager is such that the longer he holds this role the less personal and direct contribution he can make to the creative thinking of his speciality, and the more out of touch he is likely to be with the thinking and work of his 'subordinates'.



SB_1 - SB_n : Scientific bases
EP_1 - EP_n : Equipment bases
PM : Programme management
PL : Project leadership

FIGURE 10.
Model organization of managing and operating systems for research institutions (after Miller and Rice 1967)

Associated closely with this problem is that of all decision-making in respect to the scientific and practical value of research projects. Three possibilities are available:

1. judgments made by one man leadership;
2. judgments made by a team containing, from the highest levels, representatives of all necessary disciplines;
3. involving all scientific staff in the decision-making process of the institution.

Of these possibilities the first becomes less appropriate as scientific knowledge expands, techniques become more specialized and as the cost of staff and equipment increases. The second possibility, a directorate, can have similar problems, given the multitude of specializations in today's scientific world. The third possibility, based on scientific egalitarianism, denies the fact of inequality in individual competence to make jugements about their own and other's work. It is a fact that many creative scientists are not sufficiently interested in the work of others to wish to be concerned with their administrative problems. For this reason the implementation of the third method might lead either to the growth of a differentiated, unco-ordinated series of autonomous sub-institutions or to anarchy.

The nature of decision-making processes for management in research institutions, although coloured by the technical and moral values of 'research', has much in common with decision-making in any organization where the efficient use of resources is concerned. Whether or not management is in the hands of one man or of a group will tend to be a local decision.

Miller and Rice (1967) have noted a particular problem associated with management of research institutions. The change-producing process of research tends to leave behind the people who initiate the processes. They consider that research institutions should have organizational mechanisms whereby their leaders can be

changed without damage to the institution, and with as little damage as possible to the leaders concerned.

PART 2

ORGANIZATIONS IN FORESTRY

CHAPTER FIVE

ANALYSING THE ORGANIZATION

Having reviewed the sociology of organizations, and taken note of some modern trends in sociological thought which relate to the design of organizations, it is the object of this and subsequent chapters to relate those ideas to the typical forest service organization. In doing this it will be convenient to draw examples where necessary from the forest services of Australia and its territories. There is however a commonality among forest service organizations which is international in its extent. The profession of forestry is the unifying feature, with tasks and ethics which vary little between nations. For this reason conclusions drawn in this analysis are considered to be general in nature.

Using the systems concept of organizations as applied by Miller and Rice (1967) as outlined in Chapter 3, the structure of an organization will be developed around its primary task. While a large forest service will have a numerous and diverse array of tasks the charter or basic goal of most forest service organizations makes the primary task an easy one to define. The nature of the import, conversion and export functions associated with this primary task are illustrated in Figure 11.

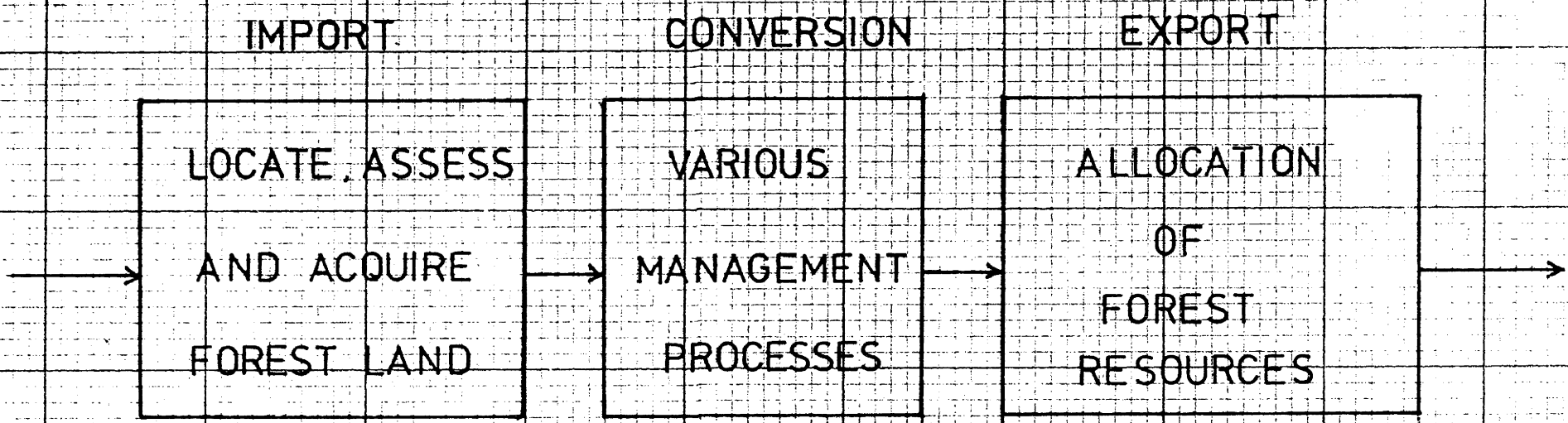


FIGURE 11.

The Primary Task of a Forest Service and its systems of activities

In the typical social and political environment of western economies, a forest service is set up to provide for the allocation of that society's forest resources. In a broad sense, the process of allocation can be considered to cover such aspects of long term responsibility for resource allocation as conservation and protection of these resources, and this is the usual case in practice. The term 'management' in its broadest sense can be used to cover this range of tasks.

In this way public forestry authorities are established 'between' a society and its forest resources. It becomes the task of the forest service to locate, define and acquire as necessary this forest resource and such tasks form the 'import functions' of the forest service organization. Having acquired appropriate parts of the forest resource, various management processes are usually prescribed in order to bring these to a condition most suitable for allocation to society at large, and these form the 'conversion functions' of the organization. Finally the actual allocation in the form required by society constitutes the major 'export function'. Such a concept can be seen to lead readily to a paternalistic attitude of the organization towards society which it serves. This in itself can be a source of stress to the organization.

THE ORGANIZATIONAL ENVIRONMENT

A forest service environment will be created by those individuals and organizations with which it must interact in the course of attaining its organizational goals. This interaction will be influenced by the customs and laws of the society concerned, particularly as they relate to land use.

It is possible to identify two forms of environmental influence, depending on whether their major effect is to act externally or internally on the forest service organization. Both play a role in determining the manner in which the organization develops structurally.

Externally Operating Influences

Such influences are seen as those with which the organization must interact in the course of conducting its 'import' and 'export' functions. [1]

A third element among the externally acting environmental influences is that dealing with general policy considerations and the co-ordination of the forest service activities with other functions of the parent organization.

The 'Import' Functions

The nature of a forest service organization's involvement with a society's natural resources of forested land depends to a large extent on the land ownership pattern of the community. In obtaining land for its purposes the forest service must compete with other land users.

If the situation is such that land is primarily vested in national or crown ownership (public ownership), initially allocation of land for forestry purposes must be resolved by negotiation between the various land authorities of the government. In the course of time the needs of society with respect to land utilization may change but because of the lengthy intervals of time which tend to occur between negotiations this process can be regarded as a discontinuous one.

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1 As the first of these is directly related to primary industry and the second is largely concerned with secondary industry, this view of the forest service organization serves to place the forest service, conceptually, in its economic role in the community.

When land ownership is primarily vested in traditional or customary title, either individual or group (private ownership), the means by which a forest service must acquire land will be different.

The usual situation with which a forest service is faced is a combination of both public and private ownership.

The 'Export' Functions

The allocation of forest resources will require an involvement with those organizations for which forest products are the input or raw material for conversion to the products sought by society. The regulation of such resource allocation, because of its influence on the overall economy, may be shared by authorities other than the forest service. Such authorities will therefore constitute part of the forest service environment as well as those organizations to which resources are allocated or who seek an allocation.

Structural Effects

While there will be localized effects in the environment, the organizations with which a forest service is involved in both the acquisition and allocation of forest resources, as well as in the determination of policy matters, will have their principal effect on the forest service organization at the headquarters or executive level. While acquisition and allocation are likely to be handled by different functional elements of the organization, the importance of both to the primary task of a forest service will ensure that their implementation is closely associated with the policy setting level of the organization.

For this reason we can forsee that the externally operating environmental influences will have an effect on the structural development of a forest service organization which is not only small in relation to its importance, but that little variation in structural form between services is likely in the context of these influences.

Internally Operating Influences

The environmental influences which act mainly internally are those associated with the physical resources controlled by the forest service, their nature and distribution.

The physical resources can be seen to vary in a number of ways. The most obvious variation is that related to geographical distribution - climatic and soil variations will not only produce differing forests but require differing management techniques.

Within a given area land use categories will depend on the cultural and economic status of the society concerned, and these categories will thus tend to change with time. The economic status of the area involved will dictate the intensity with which various land use categories are managed.

Structural Effects

Variation in extent of resource type and in the degree of intensity of management required in different areas of a forest service's domain will lead to varying degrees of functional specialization in order to perform the management tasks most efficiently. Therefore these variables will lead to structural developments of organizations which will vary from forest service to forest service.

It is this area of organizational structure development which thus shows the greatest variation between forest services. However, because each has had an independent and somewhat different political origin there would likely be differences in structural solutions even in the instance of the physical attributes of the forest resource being identical, which of course does not occur.

The differences between forest service organizations are so complex in their origin that it would be very difficult to explain them. And remembering Tom Burns' warning (page 11) it would seem of

limited value to compare one with another in the hope of finding a better solution to a particular management problem. While it is of interest to look at the various organizations developed it is likely to be more rewarding to examine the needs of any particular organization for change in the light of sociological thought, a detailed knowledge of the task involved and the environmental influences under which it is to be carried out.

CHAPTER SIX

ENVIRONMENTAL VARIABLES OF AUSTRALIAN FOREST SERVICES

Australian forest services, in common with most institutions in this country, draw much from their common heritage of custom and culture - basicly that of the colonizing nation, Great Britain. It should be noted however that the ideology of forest services in Australia has possibly more relationship to the forestry traditions of other European countries and the United States of America.

The formation of the major forest services in Australia (in the public sphere) has been influenced by the political development of the federation of states. The division of powers following federation resulted in the states retaining control of their forest resources while the national government assumed responsibility for forestry matters of national significance.[1] Also left to the federal government was the responsibility of organizing forestry administration in Australian territories. The result has been that in the sphere of Australian influence we now have six separate state services, two territorial services, and a national forestry authority - a total of nine separately constituted forestry organizations.[2]

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1 These aspects were primarily those of certain aspects of international trade, forest research and professional training.

2 (a) The forest service of newly independent Papua New Guinea, was formerly in this category, and is still strongly under Australian influence in its organizational structure.

(b) The national forestry authority, the Forestry and Timber Bureau, while retaining its primary function of co-ordinating Forest Policy, in particular with regard to international trade issues, at the national level, has been greatly reduced in its complexity over the past decade. The professional teaching responsibility passed to the Australian National University in 1965, and in 1975 the forest research component was transferred to CSIRO.

In addition to the government sponsored forest services we have in Australia one large and several smaller private forestry organizations. These, in common with the government forest services, are all part of, and hence subservient to, larger organizations, which strongly influence policy and the nature and extent of their operations.

Consideration of forest service operations brings to notice a commonality of goals, which is of course our main reason for regarding these organizations as a group. Prominent among these goals has been the supply of forest products, primarily timber, in the quantities and qualities demanded by society.

Management of the large areas of land required has of necessity meant consideration of other social needs, such as protection of water and soil resources, preservation of aesthetic values in landscape and recreational outlets, and general environmental conservation including protection of wild-life habitats. These 'secondary' goals have become of increasing social value in the rapidly urbanizing, industrializing and 'educating' context of our modern societies. Changing social needs such as these have had an impact on the environment of forest services.

The Influence of Parent Organizations

It may be logical to consider as the first environmental variable the relationship between the forest service organization and its parent organization.

The nature of the state governments' departmental systems, under ministerial control, has brought a common feature to the major forest services of Australia.[1]

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1 Australian forest services may be grouped into a number of categories. The group which is most prominent contains the state government forest services. These are of major importance in that they control the bulk of forest land and employ the majority of people engaged in forestry activities, outside the private industries, in Australia.

This policy-making and money-providing element of the forest service environment probably does not have very much effect on the structure of forest service organization. It can influence the form which the head of the forest service takes. This is the area most intimately in contact with the parent organization and which in the Australian government sponsored forest services will have to deal with political influences and translate them to policy measures where necessary. In the states of Queensland, South Australia and Western Australia there are individual 'Conservators' in charge; individual 'Directors' head the forestry organizations of the Northern Territory, A.C.T. and Papua New Guinea; a 'Director General' is head of the Forestry and Timber Bureau; a 'Commissioner' with two 'Assistant Commissioners' head the New South Wales and Tasmanian forest services; and finally, in Victoria a true Commission of three 'Commissioners' headed by a chairman is the highest authority.[1]

These variations have possibly resulted from vague political or personal influences at the time of formation of each forest service, or simply followed the pattern of other Government Departments.

The Effect of Political Change

In a system of party government it is inevitable that there are policy changes which accompany the periodic changes in electoral fortune of a society's political elements.

Because forest policies are so closely related to land use and ownership policies, which can be political issues, changes in government can at times have considerable effects on some forest service activities. Sudden changes may necessitate structural changes in the organization by the elimination or increase in certain functional roles.

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1 The variation in title is of little account compared with the form of authority dealt with in Chapter Seven.

An instance is the great increase in free-holding activity in Queensland following the change to the 'right-wing' Country Party government after many years of 'left-wing' Labour Government. This required a considerable increase in the valuation of timber stands on what was formerly crown land held under lease, and could only be carried out following field assessment by the Department of Forests.

By changing the pattern of land ownership, such politically induced land policy changes can have other effects on a forestry authority. The most apparent is a change in the power or control which a forest service has over forest resources, and hence the price of raw material to industry. This could also lead to restructuring of the elements of organization dealing with acquisition and allocation of forest resources.

The way in which a government allocates its Ministeries can influence the environment of a forest service. This is subject to change not only as governments themselves change but as the size and complexity of the various government departments change with time. In fairly recent times the New South Wales government has changed with regard to the ministerial control of the Forestry Commission and other government authorities associated with land resources. For many years the Department of Lands and the Forestry Commission came under the control of a single Minister for Lands and Forests. Subsequently Lands became a separate ministerial responsibility and the Forestry Commission was joined with the Soil Conservation Service and the Water Supply and Irrigation Commission to form the Department of Conservation. It is perhaps notable that the National Parks and Wildlife Authority remained under the control of the Minister for Lands. Since 1972 there has been a further reorganization at this level of government.

Such changes must influence to some extent the forest service environment, at least with respect to the state forest policy, and in connection with major land use decisions. It is notable however that despite the spate of ministerial changes in New South Wales the structure of the Forestry Commission at the Divisional level and below has remained virtually unchanged. Detailed consideration was given to reorganization of the Commission during 1970 and some changes were effected, but these did not relate to any changes of environment at the Ministerial-Executive level.

The Timber Industry

With the production of timber as a well entrenched primary goal of forest service organizations it is natural that the timber industry should have a marked effect on the organizational environment. While direct interchange does occur between the forest services and individual firms in the timber industry, the most significant reaction takes place between industry associations and the forest services.

Timber industries are grouped by nature of product and by geographical location. They are also grouped to some extent by the nature of the resource used. Sawmilling Associations are prominent. Sawnwood is the major product of the Australian industry (Wesney and Freestone 1973) and this is produced by a large number of units varying greatly in size and influence in the market, and dispersed largely according to the location of raw material i.e., the forest resources. There is some concentration near major market places independent of the distribution of raw material supplies.

Timber industry organizations have developed at all levels from local producer groups to state and national agencies and conferences. While the major purpose of these organizations is to promote timber product marketing, they also serve to present a united industry front to forestry authorities on matters relating to prices and allocation of raw material.

Conservation of timber supplies as a national resource and the marketing of timber products is a complex problem which is recognised by both supplier (the forest services) and user (the timber industry) of raw wood material. As a result forest services, both officially and through individual contacts, have often developed close relationships with these organizations. This has been regarded as unethical by some (Routley and Routley, 1974) but in fact the reverse is more likely the case.

The South Australian forest service presents a special case in that it owns and controls a major part of the state's forests and the major component of the state's timber industry. Industry is thus an internal environmental influence which contrasts with the external influence of the timber industry in other states.

Land Supply

Availability of land is of basic importance to a forest service. The allocation of land for forestry purposes is a process which might most rationally be undertaken by an authority responsible for and capable of overseeing the whole of a community's land use. The political problems with which such a task is fraught has meant that this situation is one which is still far from being achieved, although the Victorian State Government has made very positive steps towards this goal, at least with respect to crown land, with the formation of its Land Conservation Council.

In the absence of such an authority the state forest services are dependent upon two means of acquiring the land required for forestry purposes. The first recognises the long term nature of timber production as well as the general protective function of land under forest. This has enabled reservation of sizable tracts of forest land

under appropriate legal title in the various state land laws.[1]

The second means of acquiring land involves direct purchase on the open market. Land which is available for acquisition by this process is land formerly allocated for agricultural purposes which has become marginally economic or uneconomic for such purposes.

While district staff are likely to be involved in recommendations for land acquisition and in the demarkation of boundaries when reallocation to other uses is required, the major dealings are at headquarters level between government departments. The discontinuous nature of such dealings means that there is no strong environmental influence which would necessitate a permanent structural development in the forest service organization. It is a function best controlled by the executive and interdepartmental committees of an *ad hoc* nature may be a common means of reaching the necessary agreement on crown land transfer.

Forest Resources and their Economic Impact

The importance of forest resources to a forest service is fundamental, but the effect which these resources have on the environment of the organization depends not so much on the nature or extent in absolute terms, as on a complex of economic factors relating the forest resources and society. This combination of economic factors we will refer to as the 'economic impact'.

The factors are those which describe the results of the pressure of society on the resources which forests or forest land provide. This pressure varies with the distribution and extent of the

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1 This is obviously the most desirable form of land acquisition available to a forest service although revocation and transfer to other uses is still possible. At the present time such action is likely in order to place some land under even more secure title from a conservation viewpoint, the land becoming National Park or Wildlife Refuge, and hence not completely lost in a broad forestry sense. Most of the forest service land held today has been acquired by this first method and has been so held for many years.

resource, the size and distribution of the population and the level of demand per unit of population for forest products and amenities provided by forests.

An indication of this 'economic impact' can be obtained from a statistic derived from the total area of forest land devoted to the production of forest products and the population of the area concerned. The values for the Australian states and territories are given in Table 1.

It will be apparent that such a statistic will be clouded by many complex and interacting factors and hence of doubtful value. However, if some obvious anomalies are excluded it does give a lead to the intensity of forest land use and hence to the environmental impact of forest resources on the forest service organization concerned with their management.

The more intense the management required the more likely is an organization to develop specialized functions, and hence the structure of the organization may be influenced by the level of intensity of management. In a subsequent section this assumption will be examined more closely. With regard to the statistic we have derived here as a measure of management intensity, a low figure will indicate a high intensity.

The most obvious anomaly would appear to be that of South Australia which has virtually no natural forest resources. It has made an adjustment for this by its very large man-made forests. Such forests must rank as the most intensively managed and hence our statistic would appear to be valid. On the other hand the smaller range of technical problems associated with this type of management as compared with the diversity of natural forests would tend to permit a somewhat lesser degree of differentiation in the structure of the

TABLE 1 : Distribution of Total Forest Reserves per Head of Population

State or Territory	1975 population ('000) [a]	Total area of Reserves ('000 ha) [b]	Area of Reserves per Head of Population (hectares)
N.S.W.	4,875	3,327	0.68
VIC.	3,707	2,559	0.69
QLD.	1,954	4,777	2.44
S.A.	1,241	119	0.10
W.A.	1,102	1,998	1.81
TAS.	411	2,257	5.49
ACT.	163	56	0.34
N.T.	95	644	6.78
Total:	13,548	15,737	1.16
P.N.G.	2,684	1,819	0.68

Notes: (a) Based on projection of the 1974 population of 13.3 million (W.G. Coppell, 1974, p.13) using the average annual rate of percentage increase for the 1966-71 intercensal period (1.87 per cent)

P.N.G. figure based on information published in Papua New Guinea Resource Atlas, Jacaranda Press, 1974.

(b) From Wesney and Freestone (1973) p.5.

P.N.G. figure from Papua New Guinea Resource Atlas.

forest service organization. In the case of South Australia, as we have already mentioned, the management task has been broadened by the inclusion of extensive processing responsibilities in the Woods and Forests Department.

New South Wales and Victoria have forest service organizations with more complex organizational structures than those of the Tasmanian and Western Australian, but lesser areas of forest reservation per unit of population. The "economic impact" of forest resources has a greater environmental effect on the forest services and hence on their structure in these states.

Technical Considerations

To the professional forester technical considerations are of paramount importance in his work. As a result most of his thoughts on organization are technically oriented. His influence on structural organizational development is reflected in the creation of differentiation wherever possible based on technical functions and specialities.

However, the forest resource with which a forest service is involved must largely dictate the nature and number of technical functions required for its management. These will depend also on the importance which society places on particular products from the resources and the problems created by or in the course of their supply. While the rapidly increasing pace of technological developments affects virtually all organizations, there has not yet been an influence on forestry organizations which has greatly modified the basic structure.

It is largely in the field of technical forestry that forest services develop lines of inter-service communication. The exchange of technical information thus becomes an important catalyst for co-operation between forest services at all levels. The technical functions in this

way form the basis for another and important externally operating environmental element of forest services.

The functional divisions involved with technical specialization are outlined in the following paragraphs.

Resource Inventory

Determining the nature of forest resources requires an accurate knowledge of the tree flora of the area concerned. In the Australian states this knowledge has been acquired and absorbed into basic professional training many years ago. The occasional botanical assistance which might be needed is available from other specialized agencies. Only in the former territory of Papua New Guinea was the problem so complex and unknown as to require the establishment of a botanical function within the forest service itself. The even more specialized technique of wood identification, which is a continuing requirement although 'low key' in impact, is related to botanical knowledge but is normally dealt with in wood technology groups either internal or external to the forest service itself.

Forest inventory is a function which in itself must combine a number of specialities - land surveying and drafting, vegetation mapping, sampling theory and techniques, and the knowledge of basic flora relevant to economic forest resources. Yet it is one which is normally absorbed within another, broader forestry function - forest management. The importance of forest inventory will depend on the status of forestry plans within the area concerned. In the less exploited areas inventory plays a more prominent role in the functioning of the forest service.

Forest Management

Once past the early stages of development the forest service task is more involved with the regulation of forest yields. Inventory work is largely involved with reassessments to provide the basic data for management plans and the control of such plans. Traditional ideas are rapidly giving way to modern methods in the planning process, but the traditional 'management' function remains a most important one in the forestry organization. It also is a function which covers a number of interdependent specialities.

Silviculture

The growth of forests is of concern to the specialization known as silviculture. It is a function which normally holds a prestigious place in the forest service organization. In the Australian scene two major branches have developed around the very different tasks of native forest silviculture and plantation silviculture.

Wood Technology

Wood technology and the study of forest products is an area of concern because of the basic forest service task of providing society with an industrial raw material. This material is produced from diverse and complex natural sources but must be converted to highly standardized commercial products. There is the added problem of competition with other raw materials and the desire to find new or improved end products from timber which make wood technology an essential adjunct to a forest service.

This specialization has been provided for in the Australian services either by the establishment of appropriate facilities within the forest service, as in the case of Queensland and New South Wales, or by relying upon an external agency. Such an agency has been available to the state forest services - the CSIRO Division of Forest Products, now disbanded and reassembled in the Divisions of Building Research and Chemical Technology.

Forest Engineering

The necessity for construction of roads, bridges, fire-towers, etc. and their maintenance is one which in the larger forest services inevitably justifies the employment of professional engineers and can lead to the formation of a separate functional speciality within the organization.

Research

Both the Silvicultural and Wood Technology functions rely heavily upon research workers. Research personnel are also required in the divisions involved with forest management.

The organization of research as an entity serving the other technical functions has been suggested at times but never developed in the Australian forest services, with the exception of the Forest Research Institute as a major part of the Forestry and Timber Bureau. In that case the organization was providing services for other forestry organizations through the results of its work.

The development of research teams as small and diffuse groups within the forest services has lead to problems for people in this category and may also be seen as having affected the quality of research work in some cases. The deployment of research staff to solve the problems of technical forestry has problems which have become more prominent in recent years. These will be examined in the following chapters.

CHAPTER SEVEN

EXAMPLES OF FOREST SERVICE ORGANIZATION

In preceeding chapters we have examined in a generalized way the primary task of a forest service and the various facets of organizational environment which influence its structure. However, not all the traits which distinguish one organization from another can be ascribed objectively to particular elements or combinations of elements in the environment. There are both tangible and intangible influences and amongst the intangible are those which might be considered as organizational philosophy. This characteristic may result from the personal influence of past and present leaders. It will be seen in the attitudes and style of operation of organizations which otherwise appear very similar. In looking at examples of forest service organizations from the Australian region it will be necessary to account for such characteristics in a purely subjective manner.

The examples used were chosen with the aim of illustrating a range of organizational types amongst forest services, and also of examining organizations which, although superficially similar in structure, are different in their implementation of objectives.

The Queensland Department of Forests

This forest service is concerned with the management of an area of forest land of wider geographical distribution and larger in area than any other in Australia. (See Table 1).

The way in which the forest resources are distributed geographically, together with the very considerable variation in

nature of the resources between geographical areas,[1] appears to warrant a clearly decentralized forest service organization. Such is not the case. In fact the Queensland forest service is one of the most strongly centralized of all the Australian forest services.

There is a 'token gesture' towards decentralization to be seen in the manner in which forest districts are graded. This grading, carrying higher salary and prestige for the higher categories of district forester, is made according to various factors linked to the level of responsibility carried by the district office, such as area administered, size of log harvest, and number of staff employed.

The headquarters office controls and checks the district operations down to almost the finest detail through a series of work prescriptions, timetables, work programmes, budgets and costing checks. The functional organization of the forest service headquarters is shown in Figure 12. (post 1972).

The head of the Department, the Conservator, answers directly to the Minister for Forests in the Queensland Government. He is assisted by a Deputy Conservator, under whom the headquarters organization is divided into three divisions. Two of these are concerned with the technical aspects of the forest service and are headed by 'Senior Foresters'. The third, under the Secretary, handles administration and accounting functions. All official correspondence passes through the Secretary, all outward correspondence being signed in his name.

Some seventeen different categories of speciality or function, the major of which are known as Branches, are divided between the three

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1 Major forest reserves exist in the tropical rainforests of the far north, the cypress pine forests of the inland south, the exotic pine plantations of the southern and central coastal plains, the Hoop pine plantations of the Upper Brisbane and Mary River valleys, and the mixed Eucalypt forests of the central and southern coasts and ranges.

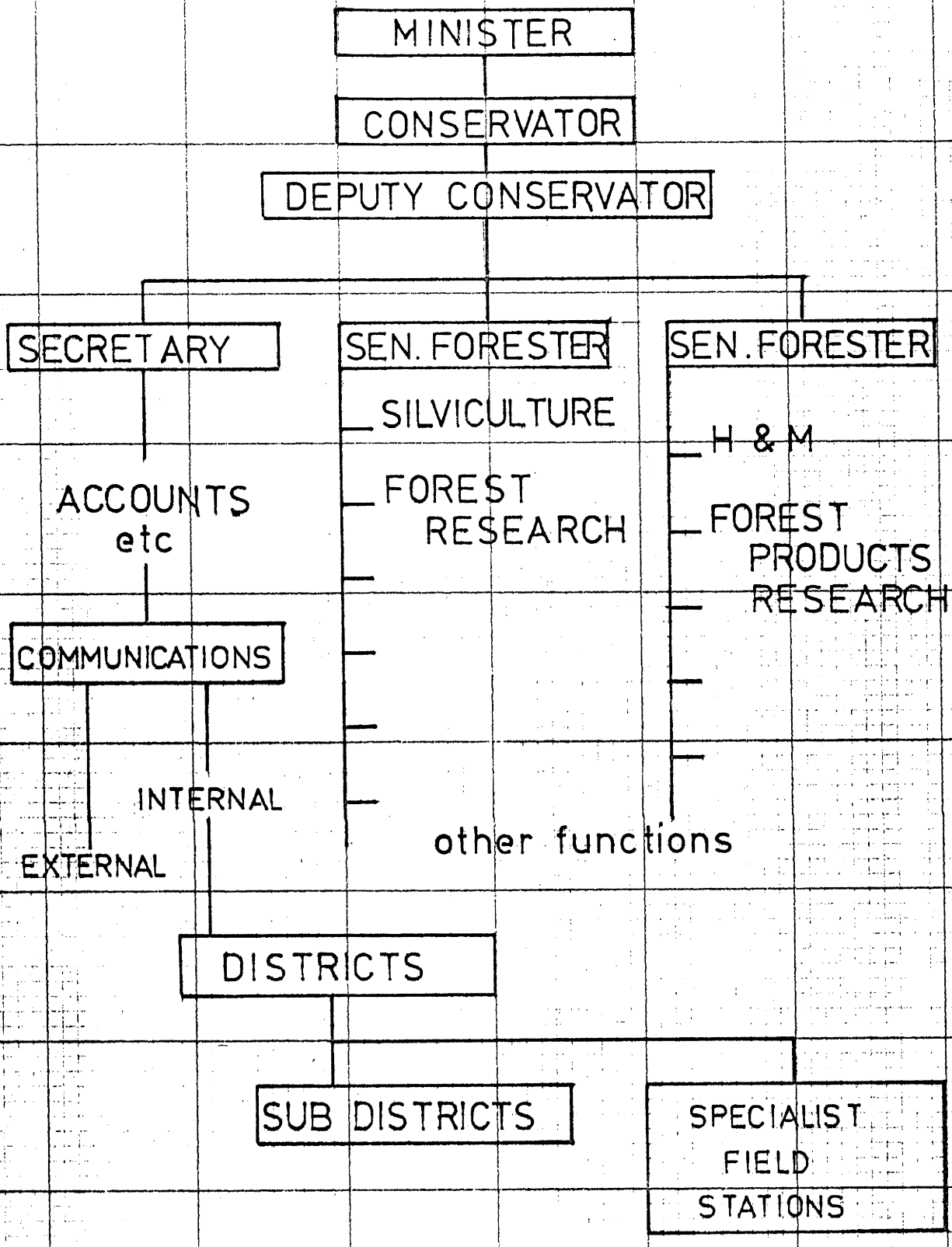

FIGURE 12.
Major structural features of the Queensland Forest Service

divisions at headquarters level. On the technical side, related branches are grouped as far as possible under the same Senior Forester. The major branches of Silviculture and Forest Research, which cover respectively plantation programmes and indigenous forest silviculture and works programmes, come together in this way, as do the Harvesting and Marketing and Forest Products Research branches.

The field operations are controlled through ten districts, organized as convenient into sub-districts. A number of research stations located in the field have their lines of communication with the appropriate headquarters function channelled through the district office.

There is no research Branch or Division involved mainly in research. Research workers are involved in four branches and results are applied when considered desirable by the executive levels at headquarters. The Department's attitude towards research is a strictly utilitarian one. The centralized control of all operations with research supervised at a high level through the headquarters based branches, ensures that prescriptions are subject to updating dependent upon research findings.

The application of research results to practice is a strong feature of the Queensland forest service. The means by which this is done ensures both application and thorough field testing. Field workers, coming under the District officers, have no choice in their routine tasks. These are defined in fine detail in the form of prescriptions for work especially those applying to technical matters.

Such a system was developed at a time when virtually all field operations were of necessity performed by sub-professional staff. The use of strict and clearly defined prescriptions for work was of great assistance to this category of employee. The service has built

up a system of training for all levels of sub-professional supervisors. Naturally, technical work prescriptions form a major part of such training. It should be noted that its success must largely depend upon stability - with any changes made being done with great care to avoid confusion, and the fewer changes the better.

The Forestry Commission of New South Wales

New South Wales has been described as the most centralized of the Australian states, with the vast majority of its population living in the vicinity of the capital. There have in recent years been political moves to decentralize and this has had some effect on forestry in the state through the favoured treatment of rural based industries.

The frequent changes which have occurred in the ministerial control of the state's forest service have already been discussed, and it was suggested that the apparent turbulence at this level has had little effect on the structure of the organization itself.

This organisation bears some resemblance both to the Queensland and the Victorian forest services at the headquarters level. It is also similar to the Queensland service in some important features of its field organization. However in operation it is much less centralized.

The headquarters structure is illustrated in Figure 13. Below the Chief Commissioner and his two Assistant Commissioners, the headquarters organization is composed of six divisions. Three of these, related to forest resources management and silviculture are combined as the responsibility of one Assistant Commissioner. The other three, relating to timber utilization and marketing, plus administration functions, are combined as the responsibility of the other Assistant Commissioner.

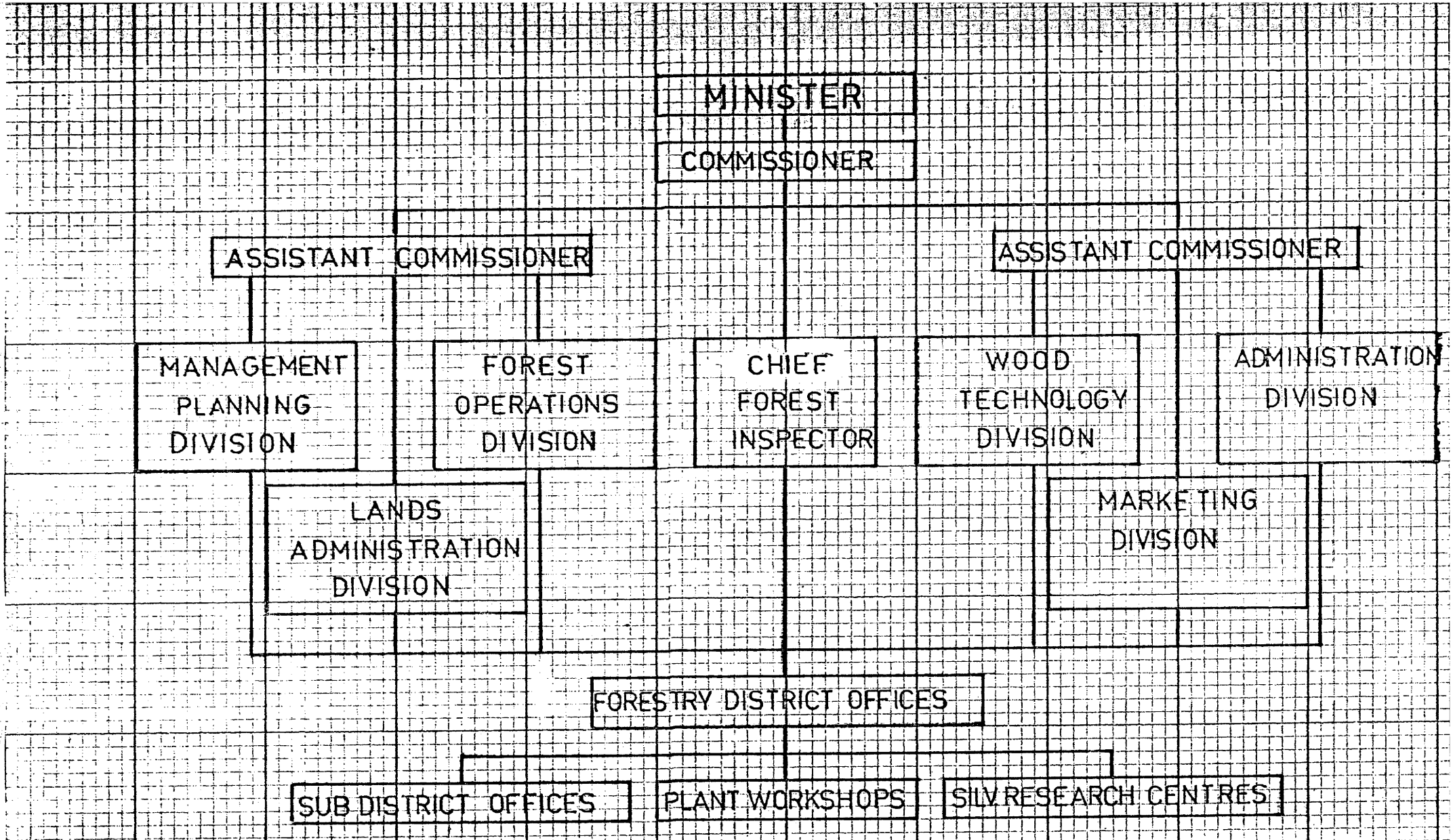

FIGURE 13. Major structural features of the New South Wales forest service

In addition, provision has been made for an independent (relative to control by either Assistant Commissioner) Chief Forest Inspector at the level of Divisional Chief. This is a new development in the organization which may be in the nature of a trial to give more personalized attention to staff matters on a state wide basis.

There is a distinct difference between the character of this forest service and that of Queensland. This might largely be traced to the method of control. It has been shown how the latter ensures a strongly centralized control. In New South Wales much more reliance appears to be placed on the initiative and interpretive skills of field staff in relation to operations and compliance with instructions. Plans are made under the direction of the appropriate headquarters function and their implementation is largely in the hands of field staff under District Foresters.

Research takes a similar role in New South Wales to that in Queensland, even to the maintenance of a Forest Products Research section. But without the strict prescriptions of the Queensland service the application of results appears more nebulous.

The Victorian Forests Commission

Reference to Table 1 will show that the state of Victoria, although much smaller in overall area than New South Wales, has a ratio of forest reserve area to population of virtually the same magnitude. The more compact nature of Victoria and its more intensive development has meant that many forest areas in the state have a ready potential as recreational outlets for the population, while forest industry is well placed relative to markets.

The Victorian forest service has developed along lines distinctly different to most other state services. This must partly be due to the fact that until recent years the service was professionally isolated from the rest of Australian state forest services as the

result of an early decision not to co-operate in the commonwealth-state forestry education scheme. The headquarters structure of the Commission (see Figure 14) bears a generally similar appearance to that of other state services, notably Queensland and New South Wales but has some distinctive modes of operation.

This service differs in being controlled by a true commission. There are three Commissioners who meet to make decisions referred to them by the Divisional Chiefs. The Commission advises the Minister for Forests in the Victorian Government.

Headquarters is divided into two senior Divisions, Forest Management and Forest Operations, and four other Divisions, Administration, Economics and Marketing, Forest Protection, and Forestry Education and Research. Each divisional chief handles a number of related functions and the headquarters staff provide the technical, planning, and research expertise required for each function. Each Headquarters Division deals directly with the field officers of the Commission in day to day matters.

In its organization of field operations the Victorian service is more decentralized than most other state forest services. The state is divided into seven Divisions, all of equal grading, but controlling from six to nine Districts each. As indicated in Figure 14, the line of command is nominally direct from the Commission to the District through the Divisional Forest Officers. Normal lines of communication are from Divisional Chief at Headquarters to the District through the Divisional Forest Office, but some functions, for example, plantation establishment, are handled by direct communication between Headquarters and District.

The accent on research appears to be much the same as in New South Wales. The proximity of the CSIRO former Division of Forest Products has certainly been used to advantage by the forest service and its dependent industry.

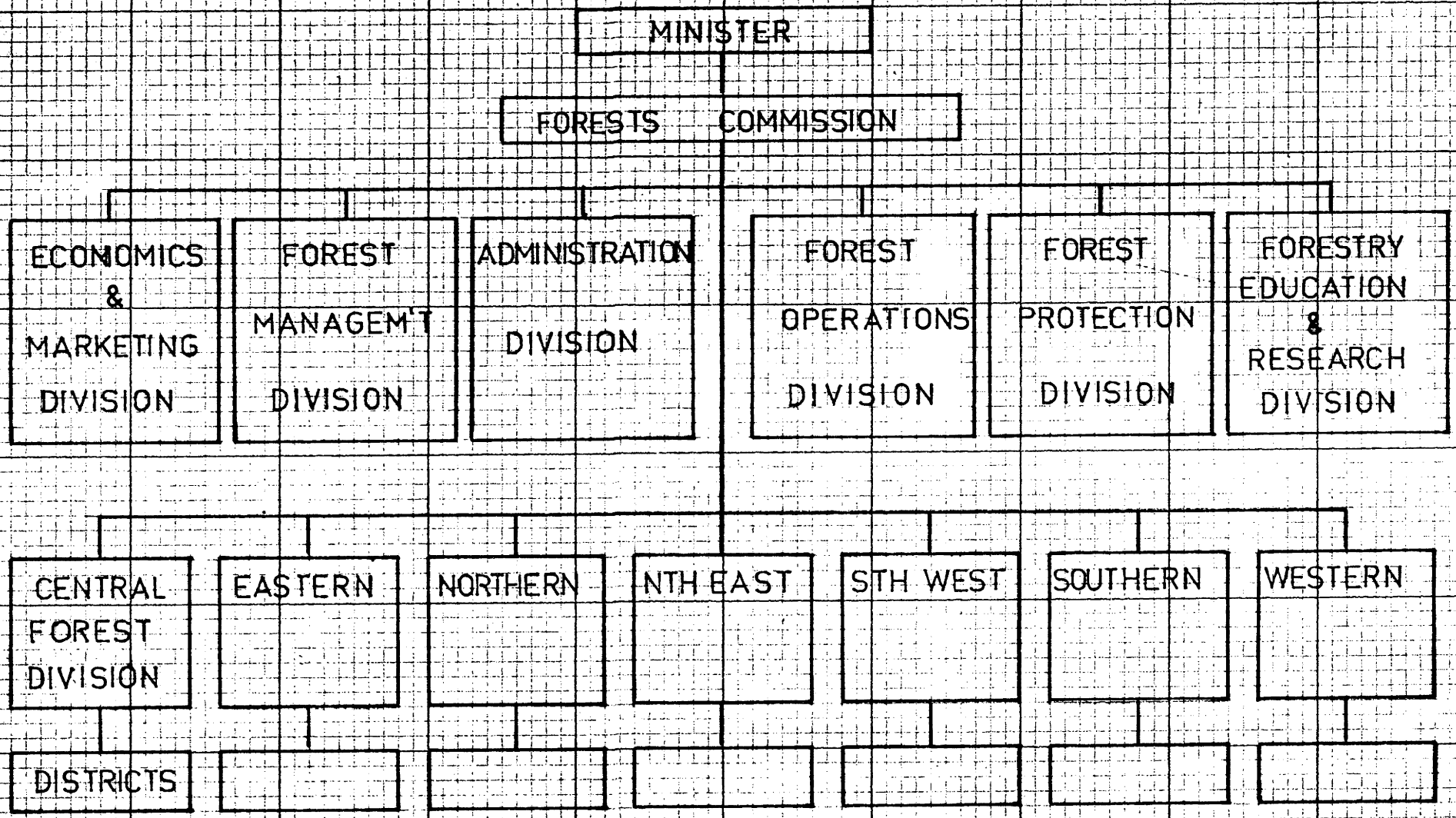

FIGURE 14.
Major structural elements of the Victorian forest service

The Tasmanian Forestry Commission

This forest service is organized along quite different lines to any of those already discussed. While it is the smallest state, Tasmania has a very large forest reserve area per unit of population. The nature of this resource and the availability of cheap electricity have permitted the establishment of major industries.

Although nominally formed as a Commission, the Chief Commissioner and his two Assistant Commissioners do take an executive role in the affairs of the forsst service, the various functions being divided between them according to personal strengths. The organization of Branches, as each functional group is known, is shown in Figure 15.

It is notable that Branch heads have equivalent rank to the senior field officer positions. The state is divided into three Regions and each region covers four Districts. It is thus apparent that the Tasmanian forest service is more decentralized than the services of Queensland, New South Wales and Victoria. The headquarters organization is also less complex, indicating a large amount of technical direction in the hands of senior field officers.

This feature is complicated by a generally more centralized control of forest management functions and accounting. Management stations are located at various District centres, and these also report directly to headquarters. The Engineering Branch has direct control of major road building projects, and accounting of revenue is also completely centralized, with field staff having little responsibility in this area, usually a significant one in Australian forest services.

Research activity has generally been held at a low key in the Tasmanian forest service, although notable forestry research has been undertaken by staff of the Commission. This work has usually

FIGURE 15.
Major structural elements of the Tasmanian forest service

been sponsored by universities. There are research positions where warranted in the Management Branch and Silviculture and Protection Branch.

A Structural Pattern

Although the examples given in the preceeding sections illustrate a number of important variations in the way a forest service can be organized, there is nevertheless a distinct pattern of organizational structure apparent.

The operational sections of the forest service, in the field, are organized as simple, almost classical bureaucracies. In the Australian situation, these sections of the organization will usually be operating under relatively stable environmental conditions. Hence the organizational type is in accordance with the expectations of Lawrence and Lorsch (1967) as outlined in Chapter 3. Objectives and policies are generally clear and of long standing. There is a single and clear chain of command and the responsibilities and numbers of subordinates attached to a supervisor are frequently good examples of organization according to the classical theory.[1]

At the headquarters or executive level of the forest service organizations examined we can see a tendency towards differentiation. This is obviously brought about by the proliferation of specialization in an increasingly technical world. But the influence of variation in intensity of management has also been indicated. Largely independent of the degree of decentralization practised by the forest service, the more highly differentiated structures occur in those forest services with the need for more intensive management.

Four major functions are common in one form or another in the forest service as typified by our examples, Forest Management,

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1 Havel (1964) has noted the low ratio of technical to professional staff, which reflects a shortage of staff in the technical category rather than an organizational objective.

Silviculture or Biological aspects of Forestry, Marketing of Forest Products, and Administration. These are grouped or represented in different ways, with a tendency to combine the routine forestry work of the service into an "operations" branch.

Research is represented to varying degrees in the forest service organization but we have seen no example in the normal forest service of a research function under which all investigational activities are administered. Instead research branches in various functions, as required, are common. Within the one forest service we have seen up to four different research groups.

The overall pattern of forest service organization appears to be a strongly centralized one, with "top heavy" technical representation at headquarters and simple district organizational structures. The forest services examined might be cited as examples of the Australian "characteristic talent" for bureaucracy, seen by Davis (1958). It is also clear that the development of forest service organizations, at least at the headquarters level, "has its roots ... in developing technology".

This bureaucratic tendency has a marked effect on the manner in which any technological advance is adopted. Rather than the establishment of pools of associated skills available to the whole organization (and even to other organizations) a new sub-section of the existing order of differentiation is set up. And because of the restrained communication patterns of a bureaucracy, such a sub-section must be of restricted value to other than the function in which it is established.

Some facilities, such as electronic computing, may be so expensive that their duplication within the organization is impracticable. Barriers to communication are breached in the cause of economy.

However it is inevitably true that the function in which a newly adopted technical facility is incorporated will dominate its use, and the inconvenience attendant upon its use by other functions of the organization will at least slow the adoption of what may well be improved technology. This tendency towards insularity of sub-sections is of course one of the well known dysfunctions of the bureaucratic form of organization.

Research groups will suffer as a result of this dys-function. The problems for research are discussed in detail in the following chapter.

The pattern of organization, the organizational structure, is basically the result of planning for communication and control. In a strict bureaucracy not only the established structure but written rules determine the communication channels available to members. However the formality of such a system need not necessarily prevent the co-operation of members. Wettenhall (1974) has quoted Baker (1972) as showing how, in the headquarters of a government department in the United Kingdom, the day-to-day working system is largely undefined, although subject to the broad framework of the organization. The informality of working relationships appears at that level of a government organization where the work is mainly "adaptive/creative". The rigidities of the bureaucratic system are broken down "when intelligent and dedicated people choose to work together in teams for the common good".

One would hope this applies in the normal forest service situation, and there are probably many personal experiences among professional foresters to confirm that it does.

This inevitably leads to the question of whether or not it is sufficient to allow such co-operation and team work to be forced to take place despite an underlying organizational structure that impedes it. The solution may not be as simple as it appears on the surface. Wettenhall (1974) has asked, "Given that the bureaucratic system developed to help us achieve a higher social order, how can we ensure that its abandonment will not result in a slipping back towards arbitrariness, favouritism, and irrationality in public administration?"

We will examine this question and possible answers with respect to a forest service in a later chapter.

CHAPTER EIGHT

RESEARCH AND THE FOREST SERVICE

Forestry is a profession of long standing in European society, and one whose practices have become synonomous with stability and conservatism in those older political communities. Even where forestry has been adopted as a requirement of natural resource management in newer nations with vastly different forest and economic conditions, the profession has brought with it at least some of these characteristics. Because research is associated with change it may appear to conflict with these more conventional characteristics of forestry.

Research has been defined, broadly and descriptively, as careful, systematic, patient study and investigation in a field of knowledge, undertaken to establish facts or principles (Mumcey, 1974). It would be very wrong to suggest that research, according to this definition, has never been prominent in the field of forestry. During the past half century research in forestry has been increasingly recognised as both desirable and necessary in order to permit improved utilization of natural resources.

We have seen the advent of the specialist research worker in many fields, and the outstanding results which have been achieved by such specialists, firstly in the understanding of natural phenomena and thence in the invention of new processes or the solving of problems based on this new knowledge. The result has been not only an acceptance of scientific research as a feature of modern society[1] but a certain "glamourizing" of the term research.

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1 Despite this general acceptance, it should be noted that"research" is still regarded as a form of "luxury" in some quarters. Research expenditure is normally one of the first areas to be cut back in any period of financial restraint.

Research is not an occupation which can be defined or encompassed by a clear set of limits. However it is common practice to subdivide research work into "basic" and applied". The former, also referred to as "pure research", is involved with the acquisition of knowledge or new facts in a field of study. The latter is involved with the application of basic knowledge to everyday problems, including the invention of new processes. Obviously the two must at times overlap.

In addition we are also confronted very frequently in forestry with another type of research which might be described as "empirical" research. In this form experiments are conducted with a certain aim, and the observations made are used to determine the best means, technically and economically, of achieving such an aim. Such experiments are not dependent upon an understanding of the basic reasons for the results. It is probable that in the past most advances in forestry, as in most other fields, were made as the direct result of this empirical approach to experimentation. The field of biology with which forestry is associated is go great that appreciable gains can still be made using this approach. Still, the application of pure scientific research, aimed at better understanding of biological principles, has much greater potential. For this reason there has been increasing acceptance within forestry organizations of the need for scientific research and hence the employment of specialist research workers.

The nature of basic research work has not lent itself to ready acceptance within the bureaucratic type of organization which we have seen to be typical of forest services. The result has been that despite the urgent recommendations of forestry conferences since the 1920s, little basic research has been undertaken in Australian

forestry problems until relatively recent years. Fielding *et al* (1958) have indicated that advances in forest research, relative to those in the related field of forest products research, were very much less significant between the years 1928 and 1958.

It appears that the need for more and better quality research was recognized by Australian forestry authorities, but the implementation of measures to obtain it, wherever attempted, were far from successful.

Requirements for Effective Research

It might not be fair to say that research calls for more concentrated effort or higher skills from the individual or for more dedicated teamwork than other forms of human endeavour. However, it is often considered that a specific requirement of research is the rare human characteristic of creativity or inventiveness. Muncey (1974) has recalled the notion that "creativity cannot be confined, straight-jacketed or regimented". This is the first factor which must be considered when defining the requirements for effective research.

This should not be taken to imply that the optimum research results will only be obtained in a completely unorganized situation. With increasingly expensive manpower and equipment costs, and an inevitably decreasing rate of return in the way of significant results as a field of research is exhausted, the need for an effective means of directing and controlling research expenditure is of increasing importance to the public interest. The methods of organization tried and found effective will be dealt with later. Firstly the conditions which affect the individual in the research field of employment will be considered.

Fielding *et al* (1958) have stated that the most important conditions in this regard are those which create a satisfactory research environment. They suggest that this may be done through the following measures:-

1. Creation of career opportunities in the research field, with promotion dependent very largely upon merit, thus providing the necessary incentive.
2. Delegation of responsibility for choice of work and method of working down to the individual level as far as is practical.
3. Provision of the administrative machinery for supervising such a system and the completely flexible organizational establishment required.

Conditions which favour the competent research worker are all important in creating the successful research environment. Not only is it essential for work to proceed in the virtual absence of administrative and other routine diversions, but the salary of the individual must be related to his professional standing and capacity for output. Any advance in salary must be in accord with the relative efforts and achievements of the individual within the organization. Salary levels in similar research institutions for comparable levels of skill and degree of achievement should be competitive. This is particularly important where the members of institutions are in close association both professionally and geographically.

It is also desirable to recognize that an individual may move in and out of research type activity at various stages of his career. This should be possible without severe disadvantage to the individual.

Fielding *et al* have noted that such conditions are contrary to those applying in normal government employment. It is in this category of employment that the vast majority of forestry research workers are found. The simple solution proposed by these authors in 1958 with regard to the upgrading of Australia's basic forestry research effort, was to transfer the Forest Research Institute from the Forestry and Timber Bureau to the CSIRO (where the desirable conditions already existed), as a separate division of that organization. This move was eventually made in 1975.

Problems of Research Workers in Forestry

Some of the statements in the preceeding section have already indicated major problems facing research workers in forest services, at least in government departments. There are however some special factors which apply to working conditions in forest services, which shall now be considered.

In the first place there is the most obvious condition of isolation. Forestry, with its widespread resource responsibility, has more professional isolation for its members than most other professional fields. Not only is isolation the result of widely dispersed work centres, but the small staff establishments which are available to most forest services is an important contributing factor.

Another factor is that of time. The long term nature of many forestry projects means that staff continuity is a definite problem. It means that staff are most desirably left stationed in the one location for lengthy periods of their career. Any departure from this, and there are many examples, inevitably means a faltering of control and diversion from original forest planning aims.

The effect of the factors of isolation and time is probably less on individual research workers than on the implementation of their results. The provision of facilities and finance is less of a problem in forestry than in many other fields of research.

Centralized control can lead to severe restriction in the nature of problems a research worker must deal with. If answers are demanded to permit direct application to operations, this can be a restricting influence on the style of the individual, and his performance will tend to be judged by his ability to blend into such a restricting work environment.

The career opportunities in most forest services are limited for research workers. A very small number of those who become involved in research can proceed to the higher salary levels in the bureaucracy of a forest service. This means that for the most part research opportunities are restricted to junior officers or to those who are prepared to accept the inevitably low ceiling on their salary.

Related to this problem is the fact that once an individual embarks on a research task, the duties are such that experience is not gained in administration and other routine matters which are a normal requirement for advancement in the non-research sectors of the forest service. Hence an officer risks career problems in the future if he chooses to enter the research field. Similar problems can confront an officer who develops the personal desire to engage in research tasks at a later stage of his career.

Recognition of undesirable salary restrictions has lead to some improvement in some government services in Australia during recent years. Provision has been made for advancement beyond an "efficiency barrier" dependent upon an officer gaining additional qualifications. These qualifications are such as may be obtained in

the normal lines of scientific research work and hence remove some of the previous salary restrictions placed upon workers in research sections.

Types of Research Organization

In the previous chapter examples were given of forest service organizations in which research received varying treatment, from small groups attached to particular forest service functions to whole functional divisions treating a particular field of research. These represented the extreme cases of research efforts among Australian forest services. In no case does a forest service provide a special research organization administering to all its research requirements.

Despite the possibility of varying philosophies with respect to research in the different forest services, all have been administered under typical public service bureaucracies. The disadvantages of this type of organization for research have been indicated in the preceeding section. Fielding *et al* (1958) have provided a vivid example of the shortcomings for research effectiveness in the case of the Forest Research Institute. In that paper they recommended a solution, for F.R.I., of transfer to CSIRO. In the circumstances, it seems lamentable that it should have taken almost twenty years to accomplish that relatively simple change. This is not to say, however, that much good work has not been accomplished by that organization in the meantime. It will take some years to gauge just how much difference

to research effectiveness this change will make.[1]

Such a solution is not possible for research groups currently established with most other forest services. Although cries for autonomy have been heard at times from even the smaller groups, most members of these groups have a strong sense of loyalty to their organization as a whole, and seek improvements of a less drastic nature. The more immediate and practical research requirements of forest services, at least in the Australian public sphere, are hampered by administrative practices which do not promote a satisfactory research environment.

Muncey (1974) has looked at the problem of organization for research on a world-wide basis and found a number of patterns of research organization which work effectively. He recognizes the need to consider the variation in philosophy between different communities which will influence the acceptability of a particular form of organization.

In order to make the assessment of an organization a practical task he has considered only four major criteria in which the pattern can vary. These are:-

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1 Forestry is not the only field of government in which research plays a significant role. It would be an interesting exercise to compare research establishments in the various bureaucracies relative to their effectiveness - were this possible. From an outsider's point of view, much good work appears to be done in the fields of Geology, Mineral Resources, Defence and Meteorology, to name a few at Federal Government level. Not all is completely satisfactory in these institutions, however, as evidenced by reports regarding the Bureau of Meteorology (Juddery, 1976). Also noteworthy was the very strong reaction by CSIRO officers to the proposed incorporation of one of its Divisions within the Department of Minerals and Energy during 1975. Obviously the play of personalities has a significant effect in these cases of discontent, and can certainly influence the effectiveness of research performance independent of the organizational structure.

1. The research goal or beneficiary.
2. The primary allegiance of the research group.
3. The basis of choosing research projects.
4. The system of selecting and promoting research personnel.

With four or five classes or possibilities for each criteria, as well as multiples of classes within each criteria, there are obviously hundreds of patterns available. Muncey has recognized only about ten in his world-wide survey. The important criteria with regard to research environment are the third and fourth in this list.

The manner of selecting research projects shows considerable variation. At one extreme projects may be largely detailed by sponsors seeking asnwers to particular problems or means of achieving a particular result. At the other extreme project selection may be left to the individual research worker, working of course in his own specialist niche. Commonly, research programmes and even individual projects will be submitted to a formal approving authority, and submissions may be subjected to cost-benefit type appraisal in the course of acceptance or rejection.

Staff selection and promotion may range from the appointment of the best available candidate for each of a fixed array of positions (and salaries, the 'establishment' of an organization) to the method of salary setting based on level of qualifications and experience for new appointments, and performance on the job for promotion described as the 'merit' system.

The most common pattern emerging from this review (Muncey 1974) is that of industry or government department as the primary beneficiary. Allegiance is to a government department or statutory authority of the government and work is undertaken on the basis of

officially approved programmes. It is notable that Muncey sees the Australian pattern (CSIRO) as the only one where selection of projects is left primarily to the individual research worker.[1] Selection and promotion of staff is the most uniform element in successful research establishments around the world, being based on appointments only on the basis of high quality applicants and promotion based on merit.

Improving Forest Research Effectiveness

The foregoing sections have indicated broadly the area in which immediate attention could be expected to yield favourable results in the form of more effective research. The task is complicated by the fact that each forest service leadership wishes, naturally, to retain control over its research functions. The ideal, from the research worker's view-point, of an antonomous body, is thus not acceptable. In the case of the Forest Research Institute, when attached to the Forestry and Timber Bureau, the situation was quite different, as here the parent body was not involved in routine forest operations.

The policy of the normal forest service with respect to research is fairly simply, to foster the implementation of sound forestry practices based on best available, economic, technical and scientific knowledge. But as Trist (1955) has said, "the urgent necessity to evolve and apply sound practices in the forests discourages this".

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1 From personal observation and experience this statement calls for qualification. Obviously the voice of the specialist should be heard in the planning of projects. Usually the responsible specialist will be the one who can most clearly see the implications as well as detailed requirements in a given field of technology. Leaving the selection of projects entirely to the specialist is of course impossible for reasons of overall budget control within the institution and similar implications on a wider, perhaps national, scale. The weight given to the specialists' proposals is a variable which is apparently more in the case of CSIRO under Australian conditions than in other institutions overseas.

In Chapter 6 it was intimated that the effectiveness of research result application varied between the state forest services, and that the strong centralized control of the Queensland Forest Service appeared to facilitate the direct and effective application of research results in the field. This virtually direct control over research has in fact forced work "along the lines of empirical research" (Trist, 1955). Although leading most rapidly to a good measure of sound forestry practice, it has also lead to the situation where further advance has been delayed more than it would otherwise have been had the development of fundamental knowledge of forest influences, etc., been given more attention at an earlier date.

In planning to improve the effectiveness of currently established forest research teams in forest services, at least under Australian conditions, we are faced with the major constraint of having to accept that these research teams will have to stay (organizationally) where they are. Considering the theory applied to research organization by Miller and Rice (1967) and outlined in Chapter 4 this pattern of organization can be seen as an advantage in that it is possible to keep distinct and closely controlled sentient and task boundaries. Theforest service, as a basicly scientific organization, will have the primary allegiance of research workers whose task boundary is project based within one of the research sections of the forest service, and whose scientific leadership can be seen to come from within the particular functional speciality at headquarters level. This last condition will of course only be attained when the senior officer in the headquarters function

is in fact an eminent scientist in the particular field.[1]

The major problem lies, as both Fielding *et al* (1958) and Muncey (1974) have stressed, in the creation of a suitable research environment. This environment has been shown to depend very largely on the effect which administrative control of career structure has on the individual.

Two state government public services have in recent years introduced a "personal salary" basis of payment for scientific officers which is similar, but effecting a smaller range of salaries, to that used by CSIRO. This means that officers in the forest services of these states are able to make progress in salary increments by obtaining recognition for additional qualifications and scientific research of an acceptable standard. The system applies on a service wide basis and benefits officers in positions other than research positions as well.

While this is certainly an advance it is not enough in itself. The additional requirement is flexibility in establishment to permit all officers, in the research sections, if qualified, to have career opportunities permitting them to reach the highest levels. That is, the advancement of an officer must not depend upon the availability of a position at the next highest rank to which he is eligible through qualifications.

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1 It is unfortunately a common experience in the bureaucracies of Australian forest services to have a senior officer placed in charge of a specialist group without having had any particular interest or experience in the speciality. In other words the appointment may be little more than a promotional step in the career of the officer concerned, with the particular qualities for leadership in the specialist group concerned being largely overlooked by the promoting authority.

There is a final point, as indicated again by both Fielding *et al* (1958) and Muncey (1974), which is that a research worker should, optimally, be delegated the responsibilities of choosing his own method of working, as well as having a substantial say in the projects with which he is to work.

At first sight the requirement of a completely flexible organizational establishment appears one which is outside the possibility of aeceptance by the public service boards of today. However, if provision is made in the regulations for officers to move both into and out of research sections without, for example, having "used" the research section to gain advancement above officers in the routine administration roles of the department, this should not prove insuperable.

Two aspects which are becoming ever more prominent in public service employment will tend to assist any move towards gaining this type of administrative flexibility for research sections. These are firstly the increasing public respect and need for more highly qualified scientists in the public service, and secondly the rapidly increasing numbers of graduates becoming available for employment and the higher standards and more liberal attitudes which these young officers will bring with them.

CHAPTER NINE

THE STRUCTURE OF FUTURE FORESTRY ORGANIZATIONS

The preceding chapters have examined forestry organizations as they are today with little comment on faults or possible improvements. If we use as a basic tenet the concept that the organizational structure must relate to its environment it is possible to evaluate the effectiveness of a given organizational structure and, using the relationships between environment and structure described by Lawrence and Lorsch (1967), to indicate the nature of any short-comings. Changes in organizational environment necessitate appropriate changes in the structure of organizations. It is for this reason that the work of these authors appears so appropriate as a guide to organizational development.

Earlier in this essay we have noted that management for change involves an appreciation of the organization's relationship with its environment. It also requires an awareness of the manner in which the organizational environment is changing. These factors combine to require of management attitudes which may well be missing at the executive and policy formulating levels of today's forestry organizations.[1] Younger generations of leaders may be expected to show more appreciation of changing conditions and changing organizational

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[1] Senior personal in major forestry services today are likely to have spent their formative years in forestry under social and economic conditions which were relatively stable compared with those of today. However Harris (1968) has recalled the bitter struggles to establish forestry and forest reserves in the early days of Australian forestry services. Such experiences must have had significant effects on attitudes towards the role of forestry in the community for many years.

requirements.[1] There is an increasing awareness of the importance of managerial training both at undergraduate levels and in the course of professional forestry careers (Yoho, 1969). Yet despite the advances of social science towards a theory of organizations in recent years, we do not have a particular answer to any particular organizational problem. The major advances in sociology appear to be in the means of analysing the problems (Lupton, 1971) and in the encouragment of a more adaptive stance for management.

Attitudes to Organization

Any voluntary or internally directed moves towards change in the structure of forest services will be dependent upon two factors, largely independent of environmental pressures. The first will be the nature of the existing organization and any ties it may have to parent bodies. The second will be the way in which members of the organization see themselves, both as individuals and as members of a team, in relation to their personal and organizational goals.

We have noted the strong bureaucratic style of the major forest services. This will tend to inhibit organizational change, and also, the expression of thoughts directed towards change. Despite any such "repression" which may have occurred in the past, the current social climate is such as to make the reconsideration of objectives, motives and hence the adoption of more appropriate organizational structures virtually imperative.

The role which leaders see for their organizations may become apparent to outsiders in reports and publications. It should certainly be apparent to close associates within an organization

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1 Henry (1967) has indicated this slow awakening to research requirements in the forest service. His discussion of the disposition of research units within the forest service to effective research efforts shows an appreciation of organizational flexibility and the benefits to be gained by considering the interplay of organizational units with their environment in the design of the organization's structure.

through normal interpersonal communication. The resultant perspective which is transmitted within the organization will have a strong bearing on the way in which any organizational change is directed, especially within a bureaucracy.

In Chapter One the concept of a "paradigm" as a means of defining the stance adopted by an organization towards forces of change and conflict was mentioned. It would be difficult to justify with confidence any such paradigm for today's forest services. However, a "human relations" model seems increasingly more acceptable. The recognition of changing objectives for the forest service, as discussed by Fearnside (1975) associated as it is with increasing awareness of the need for public involvement in forestry matters formerly considered as the sole prerogative of foresters, tends to highlight the acceptability of such a perspective within the forest service itself.

Also discussed in Chapter One was the idea of an "absorption of protest" strategy. It is possible that such an idea may be increasingly accepted within forest services, in line with an increasingly liberal attitude towards unconventional view-points. The widening of perspectives towards the top of the hierarchy which will allow such a strategy may also be self perpetrating.

Where such a strategy is absent, and hence a more restricted view of forestry functions persists, it is possible that there will be increasing conflict between the organization and society and also discontent amongst the lower ranks more in tune with changing values than the older generations at the top of the hierarchy.

Providing for New Structural Elements

It may be implied from previous chapters that great changes in the organization of the typical forest service are unlikely. When

changes take place they are likely to occur within the limits of the system imposed by the rules of the bureaucracy. However, it will be change in the form of "creative modification" (Katz and Geogopoulous, 1971) which responsible management will require.

Different functional units develop differently with respect to formal reporting relationships, criteria for rewards and control procedures (Lawrence and Lorsch, 1967), and these factors should be given appropriate consideration where organizational development is required.

Any change in an organizational environment may lead to new structural elements. These may take the form of new or reconstituted working groups, or revised working relationships between existing functions of an organization.

Complementary to the creation of new structural elements should be the provision of adequate means for their integration. To achieve effective integration the inevitable conflicts resulting from different points of view of various functional specialists must be resolved. It is a common failure of organizational restructuring to fail to plan adequate means of integration. These are left to be developed almost subconsciously, with the success of the new organization depending to a very large degree upon individual cooperativeness and the personalities of potentially conflicting members. In addition, Miller and Rice (1967) have indicated the need to avoid matching both task and sentient boundaries within the organization if long term efficiency is to be achieved.

Many tasks in a modern forestry service require a multidisciplinary approach. The project type of organization described by Miller and Rice (1967) and Kingdom (1973) appears well suited to such tasks. The flexibility of these types of organization should therefore be provided for in the structure of a forest service.

Making the Change

Reviews of organization are routine procedure in the public service controlled organizations of which most forest services are a part. Such reviews serve not only to justify any change in staff 'establishment' within a given organization but also to maintain consistency of salary levels for various levels of responsibilty and work-load over the public service as a whole. Alterations to organizational structure in such a system can be severely restricted. In adhering to the present patterns of bureaucracy, provision of flexibility is almost entirely excluded.

As a result of this style of organizational review, changes desired by members to improve their own performance and satisfaction may frequently be frustrated. Worse still, failure of reviewing officers to adequately appreciate the varying functions of an organization can result in the virtual emasculation of an organization which had formerly been reasonably effective through the development of informal organizational relationships.

How to make changes in the public service type organization which will achieve objectives such as adaption to environmental change and personal motivation under conditions of changing personal values will prove a difficult task. It will require more than a thorough and wide-spread understanding of organizational-environmental-staff-motivation relationships.

According to Starbuck (1965), organizational rigidity is rooted in the inducements-contributions-balance of the organization. He states that:

> These inducements include salaries and statuses, the pleasures of performing tasks in particular and familiar ways and of associating with particular and familiar people, and the satisfactions of contributing to the accomplishment of specific organizational goals and of molding organizational goals to personal value systems.

A successful change must at least preserve this balance of contributions and inducements amongst key members of the organization.

A common problem is the failure to take note of changing supervisor-subordinate proportions in many technically oriented fields. Thus while a particular group's responsibilities may show little change, the result of technical developments may often be to reduce the number of staff required to perform the task. The value of increased skills should at least balance the loss of supervisory responsibilities in evaluating work loads and appropriate salary levels. Under existing public service tenets this is generally not done.

Future Prospects

A number of factors are combining to breakdown traditions of organization which have shaped today's bureaucracies. In the case of forest services, the organizational environment is changing as communities become more affluent and more concerned with both resources and environmental conservation. Technology has been directed to increase manpower productivity, in both planning and application. With inevitable diminishing returns for technical improvements, the application of research effort has spread to most facets of forestry work.

These factors are permeated by personal attitudes which are being tempered by increasing inputs of technical knowledge through training and increasing tolerance generated both by improved standards of living and a broader perspective assisted by improved communication systems in society generally.

At the same time there is recognition of the need for improvements in managerial training for professional forestry. Previously isolated fields of social science will thus have their impact on forestry organizations.

The recognition of multi-disciplinary teams as a means of coping with complex problems and the flexibility in organizations which is required to facilitate the operation of such teams should have a notable impact on future forestry organizations.

At this stage it is difficult to see any change in the major functions of present forestry organizations. The tendency to group some functions into a category classed as operations may be modified as it tends to accentuate the gap between routine functional groups and research and planning groups.

A more appropriate development will permit the research and planning functions of the organization to make more intimate contact with the actual tasks of the organization. Hence the development of much more prominant planning and communication functions within the organization is to be expected.

Variation in the territorial responsibilities of forest services, together with varying degrees of difficulty in communication, impose added constraints to the form a forest service organization may effectively take within different geographical, political or enterprise boundaries. Johnston, Grayson and Bradley (1967) have shown how such factors can require additional executive levels and hence complexity within a forest service. Decentralization must be an issue of increasing concern to the future forest service. While steadily improving communication systems generally facilitate ease of control despite geographical isolation of forest districts this factor will tend to be suppressed by the need for participation in decision-making amongst the more qualified staff of tomorrow's organization.

CHAPTER TEN

GENERAL DISCUSSION

If organization is the most important of human innovations (Fabrycky and Torgersen, 1966) it is also one of the most difficult on which to obtain a concensus. In many ways a discussion of organization tends to be a delicate subject. This is primarily due to the nature of human relations which in effect constitute the "grist" to the organizational "mill".

For this reason, among others, it was not felt appropriate to deal in detail with any particular organization. Even with the generalised treatment attempted in this essay however, it was found impossible to avoid highlighting, to some extent, problems or shortcomings which were apparent to the viewpoint as an outsider.

Such expressions of criticism bear a weakness due to the lack of detailed knowledge. The atmosphere of an organization, being created by many nuances of personal interaction and philosophy of objectives, can hardly be appreciated by the casual observer, yet these are frequently the most satisfying features of an organization for the long term member, and contribute significantly to the effectiveness of its performance, at least in the short term.

The effects of change have been discussed at length and it is obvious that appropriate improvements in organizations will only be achieved at an adequate rate through critical exchange of ideas between representatives of organizations and other concerned individuals.

Application of Sociology

The primary purpose of this essay was to explore the possibility of applying organizational theory from the social science of organizations to the practical field of forest service improvement.

If the confusion engendered by the many viewpoints expressed by writers in this field can be overcome, it is apparent that present day forest service organizations bear very much in common with other forms of organization - the same set of problems and probably many of the apparent solutions.

However, the application of sociological principles to organizational improvement brings to the surface a whole set of problems in addition to those it was initially intended to solve. To a large extent these "extra" problems relate to the personal resentment of "outside" forces which intrude upon something as intimate as strongly entrenched organizational practices can become.

New ideas on organization can be considered and accepted more readily by the younger and middle age ranks of an organizational heirarchy. Despite the profound influence of the human relations school of organization theory over the past few decades, it is a common experience to find that the present day leaders of organizations have reached their position not only by virtue of their personal drive and skills, but by adherence to vogues of leadership, which are frequently unacceptable in terms of modern ideas of leadership. To a large degree the organizational structures of forest services as we have seen them have been preserved by autocratic styles of leadership.

Changes to organizational forms more in harmony with the requirements of current social values may to a large extent be seen as associated with the retirement of this generation of leaders.

The application of sociology is thus accelerating with the increasing influence of younger generations.

Terms of Leadership

Leadership is a factor of primary importance in organizations. In emphasising the structural features of organizations in this essay, and in the context of the preceding paragraphs a brief comment seems appropriate.

The demise of a charismatic leader generally leaves a sense of vacuum in an organization. There may be a reaction which in effect leads to a distinctly different leadership style. It is also a period in which breakaway movements tend to flourish. Objectives may be revised, and new courses set.

The nature of bureaucracy is to delimit such changes. However a certain sympathy for change by controlling bodies at times of changing leadership appears to allow a much greater rate of change at these times. This has definitely been a feature of forest services organizations in recent years.

Of particular interest here is a trend towards limiting periods or terms of appointment to the senior office. There is also a move towards distributing the responsibility of this office - almost to a committee level. The New Zealand Forest Service is an example of this.

Such a trend may be in line with the increasing area of technology embraced by a technical or scientific-discipline-related organization such as a forest service. It may also be stimulated by increasing demands for public participation in natural resource planning and the added demands for communication with outside interests which this creates.

Engagement of Other Disciplines

It is only in the last few years that the typical forest service has seen a place for professionally qualified people other

than foresters. The broad field of forestry still calls for the widely based training curriculum. Specialization built upon such a wide basic training is certainly the ideal as the need grows for more indepth knowledge of each facet of forestry. However the growth of forest services has found room for the engagement of other professions, in an ever increasing stream. Their accommodation has frequently found the normal rate of change in organizational establishments too slow. Biologists, economists, mathematicians, physicists and chemists have often been alloted positions designated as foresters and with inappropriate "duty statements".

It is certain that the incorporation of such officers has broadened the philosophy of forest services. Their acceptance has generally been good within a traditional "one discipline" organization.

Integrating Agencies

Change from an organizational pattern of autocratic leadership and simple "chain of command" bureaucratic process of communication, together with the incorporation of a multidisciplinary staff establishment, brings a need for extensive use of integrating agencies within an organization. The ideas of Lawrence and Lorsch, which gave considerable emphasis to this need, were examined in Chapter 3.

In a complex organization such a development could give the impression of work being little more than a series of committee meetings. As such the concept of integration must be viewed with suspicion as to its aid in increasing efficiency. It is obvious that integrating agencies must be carefully planned and controlled.

This is another aspect of organization which has been given little more than passing attention in this essay. However, it is an aspect which might easily be stressed to disadvantage.

Working Plans or Centralized Control

In considering the pattern of forest service organizations mention was made of apparent variation in the strength of centralized control between forest services, even where their basic organizational structure was very similar.

Classical forestry management practice has been "enshrined" in the use of carefully researched working plans for localized forest areas.

The implementation of such a plan supposes that it will provide a program of work in forest management of the area and also a method of working which will proceed independent of the forest officers delegated to oversee its operation from time to time. Such plans are invariably subject to review at reasonably short intervals of time. In practice the use of Working Plans as a means of forest management leaves a good deal of room for individuality in application of the plan and attention to its objectives. As such the use of Working Plans for forest districts is a form of decentralization of authority.

Concluding Remarks

The increasing concern with the inappropriate nature of forest service organizational structures, the medium through which the forestry profession must implement its objectives for the benefit of society, is certainly justified. An examination of the literature of social science indicates that such concern is common to many fields of human endeavour at the present time.

This element of concern will motivate corrective action. The search for solutions will find some value amongst time honoured principles of organization held within existing bureaucratic organizations. However there is more to be gained by an objective approach

to organizations with the assistance of modern social science. An appreciation of organizational problems and the advantages of flexibility in organizational structures will be increasingly served by the incorporation of appropriate management training in professional forestry curricula. Attitudes to management will be modified from the social viewpoint as well as by technical considerations.

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